



COMMONWEALTH of VIRGINIA

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MEMORANDUM

TO: State Water Control Board Members

FROM: Jutta Schneider, Water Planning Division Director *Jutta Schneider*

SUBJECT: Request to Proceed to Public Hearing and Comment on Proposed Amendments to the Water Quality Standards Regulation (9VAC25-260): Bacteria, Ammonia, Cadmium and Human Health Criteria

DATE: November 4, 2016

EXECUTIVE SUMMARY

Subsequent to the Board's January 14, 2016 meeting, at which time amendments to the Water Quality Standards Regulation resulting from Triennial Review were adopted, staff initiated a "follow-on" rulemaking to address several pending issues. All had been identified in the Triennial Review Notice of Intended Regulatory Action (NOIRA); therefore, the existing Regulatory Advisory Panel (RAP; see Attachment 1 for a listing of members) was reconvened to consider the following:

- Revisions to bacteria criteria for human health protection in recreation waters;
- Updates to freshwater aquatic life criteria for ammonia, as well as implementation issues and impacts to regulated dischargers;
- Revisions to cadmium criteria for the protection of aquatic life; and,
- Amendments to 94 human health criteria.

The changes proposed for all these parameters were based on relatively recent national water quality criteria recommendations made by the U.S. Environmental Protection Agency (EPA). Staff will present findings and recommendations for approval by the Board that will allow a Notice of Public Comment to be issued, so that a formal review period can commence and comments submitted on the draft amendments for further consideration before final adoption.

BACKGROUND AND ISSUES

Over the course of the rulemaking to conduct the Water Quality Standards Triennial Review, there were several issues that generated significant public comment and concerns or lacked final EPA criteria recommendations and guidance. Specifically:

1. EPA’s October 2012 recommendations for revised **bacteria criteria** were directed at protecting human health in coastal recreational waters. Across the nation, “coastal” could include either fresh (e.g., Great Lakes states) or salt water locations (e.g., Virginia’s tidewater public beaches). Staff was concerned that EPA’s bacteria criteria included a provision that all monitoring data collected within a 30-day period should be used to generate a “geometric mean”; a value representing a type of average condition. For Virginia, this is appropriate where bacteria levels at public marine beaches are monitored weekly, so four observations are available to calculate this average (in accordance with the current bacteria criteria). However, all of Virginia’s surface waters are designated for primary contact recreation; therefore, only one observed value would represent the geometric mean for the vast majority of assessed waters because DEQ’s statewide monitoring program usually collects samples on a monthly cycle. This could lead to many “false-positive” results of an impaired condition with little or no additional human health protection, as well as unnecessary use of limited agency resources for TMDL and Watershed Implementation Plan development. It was decided to remove the bacteria criteria from Triennial Review until this concern was resolved. In October 2015, EPA issued a document entitled “*Narrative Justification for Longer Duration Period for Recreational Water Quality Criteria*”, in which a period of up to 90 days is allowed to represent an acceptable critical exposure period to protect recreational uses. With this change, DEQ will typically have three observations to calculate the geometric mean, which is an improvement and more representative of average conditions for the purpose of human health protection.

The following table details the existing bacteria criteria and EPA’s recommended revisions:

Criteria Elements	EPA Recomm. #1 (cfu/100 ml) Theoretical Illness Rate 36/1,000		EPA Recomm. #2 (cfu/100 ml) Theoretical Illness Rate 32/1,000	
	Geometric Mean (cfu/100 ml)	Statistical Threshold Value (cfu/100 ml) 10% exceedance	Geometric Mean (cfu/100 ml)	Statistical Threshold Value (cfu/100 ml) 10% exceedance
Freshwater Indicator				
Current VA Criterion E. coli	126	235	NA	NA
EPA 2012 Criterion E. coli	126	410	100	320
Marine Water Indicator				
Current VA Criterion Enterococci	35	104	NA	NA
EPA 2012 Criterion Enterococci	35	130	30	110

EPA's recommended criteria offers 2 options for intended level of acceptable risk; 36 theoretical illnesses per 1,000 exposed swimmers or the slightly more conservative 32 theoretical illnesses per 1,000 exposed. Both are acceptable to EPA as protective of primary contact recreation; the current geometric mean values for fresh and saltwater in the VA Water Quality Standards Regulation for bacteria are identical to the 36/1,000 illness rate values in the EPA 2012 update.

EPA recommends a geometric mean be calculated using any and all samples within a 90 day period. Virginia's current criteria require a minimum of 4 weekly samples in a calendar month to generate a geometric mean. If there is not enough data to generate a geometric mean, only the Statistical Threshold Value is currently utilized for assessment purposes and 10% or less exceedance is assessed as meeting the recreational use.

The key issues discussed by the RAP regarding bacteria criteria were:

- Which assumed illness rate to base the criteria on? While the 32/1,000 rate is more conservative, EPA has taken the position that the 36/1000 rate is just as protective. The higher rate is the basis for all of DEQ's existing water quality assessments for bacteria levels, impairment designations and restoration target levels for TMDL Implementation Plans. Some RAP members favored the more conservative 32/1,000 rate, but did not object to continued use of the 36/1,000 rate as the basis for the criteria. **For consistency, staff will recommend that the 36/1,000 illness rate continue to be used in setting bacteria criteria.**
- Include BEACH Action Value (BAV) in Water Quality Standards Regulation (Regulation)? The current Regulation specifies 104 cfu/100 ml in marine waters as the threshold for advisories or closure notifications, issued by VA Health Department (VDH). This threshold is not strictly a water quality standard, and is actionable by VDH, not DEQ. Some RAP members preferred keeping the notification threshold in the Water Quality Standards Regulation, but did not object to dropping it if it was clearly stated that beach protection would still be maintained by VDH with clear reference to their beach monitoring program and statutory/regulatory authority to issue notifications. Therefore, **staff will recommend that the BAV not be included in the Regulation, but a reference to VDH's authority (in State Code, Title 32.1, Chap. 6, §32.1-241) to establish the BAV and make notifications based on that threshold should be included in the Regulation.**
- Should the revised bacteria criteria only apply to marine public beaches or to all surface waters statewide? EPA's recommended criteria were intended for application to "coastal recreation waters". However, all of Virginia's surface waters are designated for primary contact recreation and the Regulation does not define "coastal recreation waters". The RAP had consensus that the revised criteria should apply statewide. **Staff will recommend that the Regulation should provide the same level of protection to all State waters, and for consistency the bacteria criteria revisions be applied statewide.**

2. In August 2013, EPA issued revised, final water quality criteria recommendations for **ammonia** levels protective of aquatic life. The revised criteria are essentially twice as stringent as the existing criteria due to the inclusion of toxicity data for very sensitive species of mussels and snails. Based on data provided by the VA Department of Game and Inland Fisheries (DGIF), DEQ has determined that these freshwater mollusks are ubiquitous and present in virtually every location DGIF has surveyed for these organisms. Therefore, the impact to regulated dischargers would be felt statewide, and many comments and concerns were raised during the NOIRA comment period and RAP meetings about the cost to implement the revised criteria, especially for small facilities on headwater streams. An engineering report contracted by the VA Association of Municipal Wastewater Agencies gave figures of \$512 million in capital and \$34 million in annual operations and maintenance costs to install and run the necessary treatment upgrades to meet the more stringent limits. The revised ammonia criteria were removed from Triennial Review so further discussion of these implementation concerns could take place, and hopefully form consensus on guidance or policy to aid in addressing the potential impacts. It is important to note that no public comments were received on the technical basis for the more stringent ammonia criteria.

Virginia's current water quality standards for ammonia are dependent on pH, as well as the presence or absence of sensitive trout or early life stages of other fish; therefore, ranges of acute and chronic criteria are given for both fresh and saltwater and cannot be displayed in a single table. All combinations of these factors are accounted for in the full text of the proposed amendments included as **Attachment 2** to this memorandum.

Ammonia is a common pollutant in the effluent of municipal wastewater plants and some types of industrial discharges, unless the facility is using full nitrification processes to convert all the ammonia to nitrate. It is reasonable to conclude that permitted dischargers statewide will be affected by the proposed changes, some more than others due to the fact that they may not currently have ammonia limits and lack treatment controls, are smaller facilities (with limited user bases to fund improvements), or located on headwater streams with little assimilative capacity.

The key issues discussed by the RAP regarding ammonia criteria were:

- How to provide relief to permitted dischargers for the estimated costs of capital upgrades and annual O&M? While staff is sympathetic to the potential economic impacts that some dischargers may experience due to implementation of more stringent ammonia criteria, strictly speaking the adoption of water quality standards is to be based solely on the needs for the protection of designated uses. EPA guidance for implementing water quality criteria stresses use of scientific assessment of ecological and human health effects as the basis for controlling discharges or releases of pollutants (EPA 822-B-01-012; Dec. 2001). Such criteria are protective, but do not consider treatment technology, costs, and other feasibility factors (EPA 823-B-94-005a; Aug. 1994). Impacts due to costs are to be considered after the establishment of the criteria, with potential relief offered through a number of options, including the adoption of variances, revised designated uses or performing a Use Attainability Analysis that could demonstrate widespread socio-economic impact resulting from

criteria implementation. DEQ cannot advocate for State cost-share to offset the cost of upgrades; it would be incumbent on the affected dischargers to request that financial assistance be made available through programs such as the Water Quality Improvement Fund or other sources. It was noted during the RAP process that a discharger may perform a survey to determine the absence of the sensitive mussels in their receiving waters, and have their limits recalculated without that species in the toxicity database. This is a potential outcome for facilities on small, headwater streams that may not have the habitat necessary to support the sensitive species.

- Where the State may be able to offer some relief is in establishing **compliance schedules** that provide the time necessary for upgrades to be completed, which currently is restricted to the duration of a discharge permit (5 years) per the VPDES Permit Regulation (9 VAC 25-31). Staff drafted “Strawman” language (see **Attachment 3**) for consideration by the RAP that would allow, in the Water Quality Standards Regulation, for compliance schedules longer than 5 years with these provisions:
 - Preserves the statutory and regulatory requirement that compliance be achieved “as soon as possible”. EPA regulations do not limit compliance schedules to the term of a discharge permit and this “Strawman” language is consistent with the federal requirement.
 - Specific only to the implementation of new or more restrictive ammonia criteria.
 - Applicable only to reissuance of individual discharge permits; not allowed for new discharges.
 - On a case-by-case basis, may be justified considering factors such as, but not limited to:
 - Opportunities to minimize costs for multi-purpose, phased projects
 - Time needed for freshwater mussel surveys
 - Other relevant factors
 - Establishes interim deadlines and reported requirements.

Some RAP members, especially environmental group and citizen organization representatives, preferred keeping the current 5-year limitation for compliance schedules, which they assume ensures a “date-certain” completion of needed upgrades. In the experience of DEQ staff, there are many instances where retrofit projects to meet more stringent treatment requirements have taken longer than 5 years because additional time is needed to develop capital improvement plans and secure financing, as well as plan, design and construct the upgrade. Other RAP members, particularly representatives of the regulated community, saw the “Strawman” as a reasonable relief measure that simply conforms State regulation to federal requirements. **Staff will recommend that the “Strawman” language for extended compliance schedules, applicable to implementation of the updated ammonia criteria, be included in the proposed amendments.**

- In April 2016, EPA issued revised, final water quality criteria recommendations for **cadmium** levels protective of aquatic life. DEQ staff had originally included cadmium in the list of parameters to consider during Triennial Review with the expectation that EPA’s revised criteria recommendations were imminent in 2015. Due to the delayed release of these criteria, cadmium was removed from the Triennial Review rulemaking, but has now been considered in the follow-up rulemaking.

The following table details Virginia’s existing cadmium criteria and EPA’s recommended revisions (concentrations of the dissolved, bio-available fraction; assumed hardness = 100):

		Acute (ug/l)	Chronic (ug/l)
Freshwater	Current VA Criterion	3.9	1.1
	EPA 2016 Criterion	1.8	0.72
Marine Water	Current VA Criterion	40	8.8
	EPA 2016 Criterion	33	7.9

One issue discussed with the RAP was the potential to express another version of the criteria, **without including rainbow trout** in the toxicity database as EPA did when deriving their recommended freshwater values. The Regulation identifies certain Virginia waters as stockable or natural trout waters, but the majority of Virginia’s surface waters are not so designated. If rainbow trout are absent, the freshwater acute criterion would be slightly less stringent (2.7 ug/l); the chronic value is unchanged. However, the agency’s past policy has been to not perform this type of additional analysis for the adoption of metals criteria in the Regulation because keeping the rainbow trout data in the toxicity database provides additional protection for non-tested species that may be as, or more sensitive. Some members of the RAP, particularly representatives of the regulated community, favored inclusion of the “trout absent” criteria with application outside all identified trout waters. Others, especially environmental groups and natural resource agencies, preferred leaving the “trout absent” criteria out of the Regulation. For consistency and the reasonable added protection for other species, **staff will recommend that the cadmium criteria be proposed at the levels recommended by EPA, without a separate “rainbow trout absent” criterion.**

- Eight **human health parameters** were included in the Triennial Review rulemaking and staff was working to include them in the recommended final amendments to the Regulation presented to the Board in January 2016. However, before that could occur, in June 2015 EPA published revised recommendations for ninety-four human health criteria, which included further changes to the eight already under consideration. There was insufficient time to consider the new information for the original eight parameters, and the agency decided to address all ninety-four in the same rulemaking. Therefore, the original eight parameters were removed from the Triennial Review rulemaking and have now been considered in this more inclusive follow-up rulemaking.

The updated recommendations for these 94 human health parameters reflect the latest scientific information and EPA policies, including updated exposure factors (body weight, drinking water consumption rates, fish consumption rate), bioaccumulation factors, toxicity factors (reference dose, cancer slope factor), and relative source contributions.

Due to the large number of parameters involved, a summary is provided below of the potential changes to the criteria for the affected 94 parameters. The full list of the parameters from EPA, comparing previous water quality criteria with the updated values, is included as **Attachment 4**.

- Each has two criteria (public water supply and non-water supply) for a total of 188 individual criteria concentrations.
- 127 of these would become more stringent
- 57 would become less stringent
- 2 would be unchanged
- 2 are new additions; did not have criteria in the current Regulation

The key issues discussed by the RAP regarding human health criteria were:

- Accept EPA's Relative Source Contribution (RSC) factor (20% in most cases), propose an alternate when data supports it, or don't apply the RSC? EPA has included use of the RSC in their "*Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health*" since first published in 2000. EPA has used this methodology for a few criteria that they developed after 2000, but this is the first time the RSC has been broadly applied to update the majority of the criteria. This RSC is included in the calculation of the criteria for non-carcinogens (45 of the 94 chemicals), but not the carcinogens. Several RAP members objected to the 20% RSC factor being applied to the criteria for non-carcinogens. This RSC essentially allocates only 20% of the allowable human exposure to chemical pollutants from fish consumption and drinking water (in a public water supply). This means that compared to previous criteria, where all of the potential exposure to humans would be from contaminated fish or drinking water, the new criteria concentrations are now only 20% (in most cases) of the previous value because EPA is allocating the other 80% of the allowable exposure to be from other sources, such as other commercial fish, other foods, air, industrial or home or office exposure. The rationale for this approach according to EPA is that the objective of the water quality criteria is to ensure that an individual's total exposure from all sources does not exceed the threshold of total allowable exposure to the chemical. While staff recognizes and shares some of the concerns about this issue, there is no practical way of proposing alternate criteria based on new science that would be considered approvable by EPA; Virginia has done no additional research (nor has the resources to) in support of an alternative RSC factor.

While the RSC value applied may seem arbitrary and capricious to some, EPA updated the human health criteria to reflect chemical-specific relative source contributions (RSC) ranging from 20 to 80 percent following the Exposure Decision

Tree approach described in EPA’s methodology (USEPA 2000). Because EPA proposed these updated criteria to the public and requested comments, it is EPA’s view that these criteria have undergone review on a national level and no additional facts have been presented that indicate any other alternate estimates for different exposure assumptions would be appropriate for these chemicals. The chemical industry did not present any convincing evidence to EPA for alternate exposure assumptions. RAP members representing the regulated dischargers held to their opinion that use of the 20% RSC was arbitrary, unnecessarily and overly conservative, and that either no RSC or 80% be used (the value appearing to be supportable in most cases where there are relevant data). However, this issue is now nationally established EPA policy and it is unlikely alternative criteria would be approved if based on different RSC values without thorough, scientific supporting justification. Therefore, **staff will recommend that amended criteria for the 94 updated human health parameters be proposed at the levels recommended by EPA.**

- In EPA’s recommended criteria, benzene is expressed as a range of values. Virginia cannot adopt a range as a Water Quality Standard. The current benzene criteria and EPA’s recommended ranges are as follows:

		Potable Water Supply (ug/l)	All Other Waters (ug/l)
Benzene	Current VA Criterion	22	510
	EPA 2015 Criterion	5.8 - 21	160 - 580

It was suggested during the RAP process by the Virginia Department of Health representative that the Maximum Contaminant Level applicable to drinking water (5 ug/l) be used as a guide for recommended criteria. Use of conservative stringent criteria, at the lower end of the ranges for both “PWS” and “All Other Waters”, would provide human health protection in cases where drinking water treatment typically does not remove volatile organics. Review of water quality monitoring data since 1998 shows few observations of benzene above detection levels, and usually only in connection with a pollution incident. An analysis of discharge data was done for facilities covered by individual permits as well as General Permits; very few effluent discharges contain benzene and only in concentrations below 5 ug/L. It is staff’s belief that this is evidence that benzene is not a widespread issue and any elevated levels of benzene discharges are more likely to be an atypical event, and uncharacteristic of normal discharge patterns. Because the criteria at the lower end of EPA’s recommended ranges represented a balanced approach between human health protection (supported by EPA toxicity data) and feasibility to implement without significant impact on regulated dischargers, the RAP appeared to reach consensus on the values discussed. Therefore, **staff will recommend that stringent criteria, at**

the lower end of EPA’s recommended ranges for benzene, be proposed for PWS at 5.8 ug/l, and for “All Other Waters” at 160 ug/l.

ATTORNEY GENERAL CERTIFICATION

These proposed amendments have been forwarded to the Office of the Attorney General for agency statutory authority, but authority has not yet been granted. The amendments will be proposed "contingent upon Attorney General Office statutory authority" if not received by the December Board meeting.

PRESENTER CONTACT INFORMATION:

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ATTACHMENTS

- #1 - Ad Hoc Regulatory Advisory Panel Members, 2016.
- #2 – Full text of proposed amendments to the Water Quality Standards Regulation (9VAC25-260) under this rulemaking, including ammonia criteria
- #3 – Draft “Strawman” language: Extended Compliance Schedule Provisions to implement ammonia criteria
- #4 - *“Comparison of EPA’s 2015 Final Updated Human Health Ambient Water Quality Criteria and Previous AWQC”* (EPA, June 2015)

Attachment 1

**Regulatory Advisory Panel Membership
 (“Follow-on” Rulemaking to Triennial Review)**

Organization	Contact #1	Contact #2
Water Environment Federation	Chris French	
Chesapeake Bay Foundation	Joe Wood, CBF-VA Staff Scientist	Rebecca LePrell, CBF-VA Exec. Dir.
City of Richmond	Robert Steidel, DPU Director	Grace LeRose, TMDL Coordinator
Dominion Power	Oula Shehab-Dandan	
EPA Region 3	Cheryl Atkinson, EPA Region 3 Water Protection Division/Office of Watersheds	
Friends of the Rivers of Virginia	Patti Jackson	Bill Tanger
James River Association	Jamie Brunkow, JRA-Lower James Riverkeeper	Bill Street, JRA- Executive Director
U.S. Fish and Wildlife Service	Susan Lingenfelter, VA Field Office	Serena Ciparis, VA.Tech (USFWS Proxy)
VA Association of Municipal Wastewater Agencies (VAMWA)	Ted Henefin, VAMWA President	Jamie Heisig-Mitchell
VA Chamber of Commerce Natural Resources Committee	Clayton Walton (alternate for Dennis Tracy)	
Virginia Coal Association (now VA Coal & Energy Alliance)	John Paul Jones, Alpha Natural Resources Services, LLC	
VA Dept. of Conservation and Recreation	Thomas Smith, DCR-Natural Heritage Div. Dir.	Rene Hypes, DCR- Natural Heritage Program
VA Department of Health (VDH)	Margaret Smigo, Waterborne Hazards Control Manager	Dwight Flammia, State Public Health Toxicologist
VA Department of Game and Inland Fisheries (DGIF)	Ray Fernald, DGIF-Env. Services Manager	Ernie Aschenbach, Env. Services Biologist
VA Manufacturers Association (VMA) and VA Mining Issues Group	Andrew Parker, Honeywell-Hopewell	Brooks Smith, Troutman Sanders

Invited, but did not participate: U.S. Navy – Naval Facilities Engr. Command; Virginia Save our Streams; Hampton Roads Planning District Commission; The Nature Conservancy, VA Chamber of Commerce Natural Resources Committee; VA Farm Bureau Federation; VA Institute of Marine Science

ATTACHMENT 2

9VAC25-260-140. Criteria for surface water.

A. Instream water quality conditions shall not be acutely¹ or chronically² toxic except as allowed in 9VAC25-260-20 B (mixing zones). The following are definitions of acute and chronic toxicity conditions:

"Acute toxicity" means an adverse effect that usually occurs shortly after exposure to a pollutant. Lethality to an organism is the usual measure of acute toxicity. Where death is not easily detected, immobilization is considered equivalent to death.

"Chronic toxicity" means an adverse effect that is irreversible or progressive or occurs because the rate of injury is greater than the rate of repair during prolonged exposure to a pollutant. This includes low level, long-term effects such as reduction in growth or reproduction.

B. The following table is a list of numerical water quality criteria for specific parameters.

Table of Parameters^{6,7}

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Acenaphthene (µg/l) 83329					670 <u>70</u>	990 <u>90</u>
Acrolein (µg/l) 107028					6.1 <u>3</u>	9.3 <u>400</u>
Acrylonitrile (µg/l) 107131 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.51 <u>0.61</u>	2.5 <u>70</u>
Aldrin (µg/l) 309002 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .	3.0		1.3		0.00049 <u>0.00000</u> <u>77</u>	0.00050 <u>0.00000</u> <u>77</u>
Ammonia (µg/l) 766-41-7 Chronic criterion is a 30- day average concentration not to be exceeded more than once every three (3) years on the average.(see 9VAC25-						

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
260-155)						
Anthracene (µg/l) 120127					8,300 <u>300</u>	40,000 <u>400</u>
Antimony (µg/l) 7440360					5.6	640
Arsenic (µg/l) ⁵ 7440382	340	150	69	36	10	
Bacteria (see 9VAC25-260-160 and 170)						
Barium (µg/l) 7440393					2,000	
Benzene (µg/l) 71432 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					22 <u>5.8</u>	510 <u>160</u>
Benzidine (µg/l) 92875 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.00086 <u>0.0014</u>	0.0020 <u>0.11</u>
Benzo (a) anthracene (µg/l) 56553 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.038 <u>0.012</u>	0.18 <u>0.013</u>

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Benzo (b) fluoranthene (µg/l) 205992 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.038 <u>0.012</u>	0.18 <u>0.013</u>
Benzo (k) fluoranthene (µg/l) 207089 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.038 <u>0.12</u>	0.18 <u>0.13</u>
Benzo (a) pyrene (µg/l) 50328 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.038 <u>0.0012</u>	0.18 <u>0.0013</u>
Bis2-Chloroethyl Ether 111444 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.30	5.3 <u>22</u>
<u>Bis (chloromethyl) Ether</u> 542881 <u>Known or suspected carcinogen; human health criteria at risk level 10⁻⁵</u>					<u>0.0015</u>	<u>0.17</u>
Bis2-Chloroisopropyl Ether (<u>Bis (2-Chloro-1-methylethyl) Ether</u>) (µg/l) 108601					1,400 <u>200</u>	65,000 <u>4,000</u>

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Bis(2-Ethylhexyl) Phthalate (µg/l) 117817 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ . Synonym = Di-2-Ethylhexyl Phthalate.					42 <u>3.2</u>	22 <u>3.7</u>
Bromoform (µg/l) 75252 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					43 <u>70</u>	1,400 <u>1,200</u>
Butyl benzyl phthalate (µg/l) 85687					1,500 <u>0.10</u>	1,900 <u>0.10</u>

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
<p>Cadmium (µg/l)⁵ 7440439</p> <p>Freshwater values are a function of total hardness as calcium carbonate (CaCO₃) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.</p> <p>Freshwater acute criterion (µg/l) WER = $e^{-\frac{(1.128[\ln(\text{hardness})] - 3.828)}{3.828}}$</p> <p>$e^{(0.9789[\ln(\text{hardness})] - 3.866)}$ <u>(CF_a)</u></p> <p>Freshwater chronic criterion (µg/l) WER = $e^{-\frac{(0.7852[\ln(\text{hardness})] - 3.490)}{3.490}}$</p> <p>$e^{(0.7977[\ln(\text{hardness})] - 3.909)}$ <u>(CF_c)</u></p> <p>WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F</p> <p>e = natural antilogarithm ln = natural logarithm <u>CF = conversion factor a (acute) or c (chronic)</u> <u>CF_a = 1.136672 - [(ln hardness)(0.041838)]</u> <u>CF_c = 1.101672 - [(ln hardness)(0.041838)]</u></p>	<p>3.9 <u>1.8</u> CaCO₃ = 100</p>	<p>1.4 <u>0.72</u> CaCO₃ = 100</p>	<p>40 <u>33</u> X WER</p>	<p>8.8 <u>7.9</u> X WER</p>	5	

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Carbon tetrachloride (µg/l) 56235 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					2.3 <u>4.0</u>	16 <u>50</u>
Chlordane (µg/l) 57749 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .	2.4	0.0043	0.09	0.0040	0.0080 <u>0.0031</u>	0.0081 <u>0.0032</u>
Chloride (µg/l) 16887006 Human Health criterion to maintain acceptable taste and aesthetic quality and applies at the drinking water intake. Chloride criteria do not apply in Class II transition zones (see subsection C of this section).	860,000	230,000			250,000	
Chlorine, Total Residual (µg/l) 7782505 In DGIF class i and ii trout waters (9VAC25-260-390 through 9VAC25-260-540) or waters with threatened or endangered species are subject to the halogen ban (9VAC25-260-110).	19 See 9VAC2 5-260- 110	11 See 9VAC2 5-260- 110				

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Chlorine Produced Oxidant (µg/l) 7782505			13	7.5		
Chlorobenzene (µg/l) 108907					130 <u>100</u>	1,600 <u>800</u>
Chlorodibromomethane (µg/l) 124481 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					4.0 <u>8.0</u>	130 <u>210</u>
Chloroform (µg/l) 67663					340 <u>60</u>	11,000 <u>2,000</u>
2-Chloronaphthalene (µg/l) 91587					1,000 <u>800</u>	1,600 <u>1,000</u>
2-Chlorophenol (µg/l) 95578					81 <u>30</u>	150 <u>800</u>
Chlorpyrifos (µg/l) 2921882	0.083	0.041	0.011	0.0056		

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Chromium III (µg/l) ⁵ 16065831 Freshwater values are a function of total hardness as calcium carbonate CaCO ₃ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. Freshwater acute criterion µg/l WER $[e^{(0.8190[\ln(\text{hardness}))+3.7256]}]$ (CF _a) Freshwater chronic criterion µg/l WER $[e^{(0.8190[\ln(\text{hardness}))+0.6848]}]$ (CF _c) WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140.F e = natural antilogarithm ln=natural logarithm CF = conversion factor a (acute) or c (chronic) CF _a = 0.316 CF _c =0.860	570 (CaCO ₃ = 100)	74 (CaCO ₃ = 100)			100 (total Cr)	
Chromium VI (µg/l) ⁵ 18540299	16	11	1,100	50		

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Chrysene (µg/l) 218019 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.0038 <u>1.2</u>	0.018 <u>1.3</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Copper (µg/l) ⁵ 7440508 Freshwater values are a function of total hardness as calcium carbonate CaCO ₃ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. Freshwater acute criterion (µg/l) $WER [e^{\{0.9422[\ln(\text{hardness})]-1.700\}}] (CF_a)$ Freshwater chronic criterion (µg/l) $WER [e^{\{0.8545[\ln(\text{hardness})]-1.702\}}] (CF_c)$ WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F. e = natural antilogarithm ln=natural logarithm CF = conversion factor a (acute) or c (chronic) CF _a = 0.960 CF _c = 0.960 Acute saltwater criterion is a 24-hour average not to be exceeded more than once every three years on the average.	13 CaCO ₃ = 100	9.0 CaCO ₃ = 100	9.3 X WER	6.0 X WER	1,300	

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Cyanide, Free (µg/l) 57125	22	5.2	1.0	1.0	140 <u>4</u>	16,000 <u>400</u>
DDD (µg/l) 72548 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.0031 <u>0.0012</u>	0.0031 <u>0.0012</u>
DDE (µg/l) 72559 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.0022 <u>0.00018</u>	0.0022 <u>0.00018</u>
DDT (µg/l) 50293 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ . Total concentration of DDT and metabolites shall not exceed aquatic life criteria.	1.1	0.0010	0.13	0.0010	0.0022 <u>0.00030</u>	0.0022 <u>0.00030</u>
Demeton (µg/l) 8065483		0.1		0.1		
Diazinon (µg/l) 333415	0.17	0.17	0.82	0.82		
Dibenz (a, h) anthracene (µg/l) 53703 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.038 <u>0.0012</u>	0.18 <u>0.0013</u>
1,2-Dichlorobenzene (µg/l) 95501					420 <u>1,000</u>	1,300 <u>3,000</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
1,3- Dichlorobenzene (µg/l) 541731					320 <u>7</u>	960 <u>10</u>
1,4 Dichlorobenzene (µg/l) 106467					63 <u>300</u>	190 <u>900</u>
3,3 Dichlorobenzidine 91941 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.24 <u>0.49</u>	0.28 <u>1.5</u>
Dichlorobromomethane (µg/l) 75274 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					5.5 <u>9.5</u>	170 <u>270</u>
1,2 Dichloroethane (µg/l) 107062 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					3.8 <u>99</u>	370 <u>6,500</u>
1,1 Dichloroethylene (µg/l) 75354					330 <u>300</u>	7,100 <u>20,000</u>
1,2-trans- dichloroethylene (µg/l) 156605					140 <u>100</u>	10,000 <u>4,000</u>
2,4 Dichlorophenol (µg/l) 120832					77 <u>10</u>	290 <u>60</u>

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
2,4 Dichlorophenoxy acetic acid (Chlorophenoxy Herbicide) (2,4-D) (µg/l) 94757					100 <u>1,300</u>	<u>12,000</u>
1,2-Dichloropropane (µg/l) 78875 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					5.0 <u>9.0</u>	150 <u>310</u>
1,3-Dichloropropene (µg/l) 542756 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					3.4 <u>2.7</u>	210 <u>120</u>
Dieldrin (µg/l) 60571 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .	0.24	0.056	0.71	0.0019	0.00052 <u>0.00001</u> 2	0.00054 <u>0.00001</u> 2
Diethyl Phthalate (µg/l) 84662					17,000 <u>600</u>	44,000 <u>600</u>
2,4 Dimethylphenol (µg/l) 105679					380 <u>100</u>	850 <u>3,000</u>
Dimethyl Phthalate (µg/l) 131113					270,000 <u>2,000</u>	1,100,000 0 <u>2,000</u>
Di-n-Butyl Phthalate (µg/l) 84742					2,000 <u>20</u>	4,500 <u>30</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
2,4 Dinitrophenol (µg/l) 51285					69 <u>10</u>	5,300 <u>300</u>
<u>Dinitrophenols (µg/l)</u> <u>25550587</u>					<u>10</u>	<u>1,000</u>
2-Methyl-4,6-Dinitrophenol (µg/l) 534521					43 <u>2</u>	280 <u>30</u>
2,4 Dinitrotoluene (µg/l) 121142 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					4.1 <u>0.49</u>	34 <u>17</u>
Dioxin 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin (µg/l) 1746016					5.0 E-8	5.1 E-8
1,2-Diphenylhydrazine (µg/l) 122667 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵					0.36 <u>0.3</u>	2.0
Dissolved Oxygen (µg/l) (See 9VAC25-260-50)						
Alpha-Endosulfan (µg/l) 959988 Total concentration alpha and beta-endosulfan shall not exceed aquatic life criteria.	0.22	0.056	0.034	0.0087	62 <u>20</u>	89 <u>30</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Beta-Endosulfan (µg/l) 33213659 Total concentration alpha and beta- endosulfan shall not exceed aquatic life criteria.	0.22	0.056	0.034	0.0087	62 <u>20</u>	89 <u>40</u>
Endosulfan Sulfate (µg/l) 1031078					62 <u>20</u>	89 <u>40</u>
Endrin (µg/l) 72208	0.086	0.036	0.037	0.0023	0.059 <u>0.03</u>	0.060 <u>0.03</u>
Endrin Aldehyde (µg/l) 7421934					0.29 <u>1</u>	0.30 <u>1</u>
Ethylbenzene (µg/l) 100414					530 <u>68</u>	2,100 <u>130</u>
Fecal Coliform (see 9VAC25-260-160)						
Fluoranthene (µg/l) 206440					130 <u>20</u>	140 <u>20</u>
Fluorene (µg/l) 86737					1,100 <u>50</u>	5,300 <u>70</u>
Foaming Agents (µg/l) Criterion measured as methylene blue active substances. Criterion to maintain acceptable taste, odor, or aesthetic quality of drinking water and applies at the drinking water intake.					500	
Guthion (µg/l) 86500		0.01		0.01		

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Heptachlor (µg/l) 76448 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .	0.52	0.0038	0.053	0.0036	0.00079 <u>0.00005</u> 9	0.00079 <u>0.00005</u> 9
Heptachlor Epoxide (µg/l) 1024573 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .	0.52	0.0038	0.053	0.0036	0.00039 <u>0.00032</u>	0.00039 <u>0.00032</u>
Hexachlorobenzene (µg/l) 118741 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.0028 <u>0.00079</u>	0.0029 <u>0.00079</u>
Hexachlorobutadiene (µg/l) 87683 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					4.4 <u>0.1</u>	180 <u>0.1</u>
Hexachlorocyclohexane Alpha-BHC (µg/l) 319846 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.026 <u>0.0036</u>	0.049 <u>0.0039</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Hexachlorocyclohexane Beta-BHC (µg/l) 319857 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.091 <u>0.080</u>	0.17 <u>0.14</u>
Hexachlorocyclohexane (µg/l) (Lindane) Gamma-BHC 58899 Known or suspected carcinogen; human health criteria at risk level 10⁻⁵.	0.95		0.16		0.98 <u>4.2</u>	1.8 <u>4.4</u>
<u>Hexachlorocyclohexane (HCH)-Technical (µg/l)</u> <u>608731</u> <u>Known or suspected carcinogen; human health criteria at risk level 10⁻⁵.</u>					<u>0.066</u>	<u>0.1</u>
Hexachlorocyclopentadiene (µg/l) 77474					40 <u>4</u>	1,100 <u>4</u>
Hexachloroethane (µg/l) 67721 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					14 <u>1</u>	33 <u>1</u>
Hydrogen sulfide (µg/l) 7783064		2.0		2.0		

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Indeno (1,2,3,-cd) pyrene (µg/l) 193395 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.038 <u>0.012</u>	0.18 <u>0.013</u>
Iron (µg/l) 7439896 Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					300	
Isophorone (µg/l) 78591 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					350 <u>340</u>	9,600 <u>18,000</u>
Kepone (µg/l) 143500		zero		zero		

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Lead (µg/l) ⁵ 7439921 Freshwater values are a function of total hardness as calcium carbonate CaCO ₃ mg/l and the water effect ratio. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. Freshwater acute criterion (µg/l) WER [e ^{1.273[ln(hardness)]-1.084}] Freshwater chronic criterion (µg/l) WER [e ^{1.273[ln(hardness)]-3.259}] WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F e = natural antilogarithm ln = natural logarithm	120 CaCO ₃ = 100	14 CaCO ₃ = 100	240 X WER	9.3 X WER	15	
Malathion (µg/l) 121755		0.1		0.1		

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Manganese (µg/l) 7439965 Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					50	
Mercury (µg/l) ⁵ 7439976	1.4	0.77	1.8	0.94		
Methyl Bromide (µg/l) 74839					47 <u>100</u>	1,500 <u>10,000</u>
<u>3-Methyl-4-Chlorophenol</u> 59507					<u>500</u>	<u>2,000</u>
Methyl Mercury (Fish Tissue Criterion mg/kg) 8 22967926					0.30	0.30
Methylene Chloride (µg/l) 75092 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ Synonym = Dichloromethane					46 <u>20</u>	5,900 <u>1,000</u>
Methoxychlor (µg/l) 72435		0.03		0.03	100 <u>0.02</u>	<u>0.02</u>
Mirex (µg/l) 2385855		zero		zero		

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Nickel (µg/l) ⁵ 744002 Freshwater values are a function of total hardness as calcium carbonate CaCO ₃ mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. Freshwater acute criterion µg/l $WER [e^{0.8460[\ln(\text{hardness})] + 1.312}] (CF_a)$ Freshwater chronic criterion (µg/l) $WER [e^{0.8460[\ln(\text{hardness})] - 0.8840}] (CF_c)$ WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F e = natural antilogarithm ln = natural logarithm CF = conversion factor a (acute) or c (chronic) CF _a = 0.998 CF _c = 0.997	180 CaCO ₃ = 100	20 CaCO ₃ = 100	74 X WER	8.2 X WER	610	4,600
Nitrate as N (µg/l) 14797558					10,000	
Nitrobenzene (µg/l) 98953					47 <u>10</u>	690 <u>600</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
N-Nitrosodimethylamine (µg/l) 62759 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.0069	30
N-Nitrosodiphenylamine (µg/l) 86306 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					33	160 60
N-Nitrosodi-n- propylamine (µg/l) 621647 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.050	5.1
Nonylphenol 1044051	28	6.6	7.0	1.7		
Parathion (µg/l) 56382	0.065	0.013				
PCB Total (µg/l) 1336363 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵		0.014		0.030	0.00064	0.00064
Pentachlorobenzene (µg/l) 608935					<u>0.1</u>	<u>0.1</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Pentachlorophenol (µg/l) 87865 Known or suspected carcinogen; human health criteria risk level at 10 ⁻⁵ Freshwater acute criterion (µg/l) $e^{(1.005(\text{pH})-4.869)}$ Freshwater chronic criterion (µg/l) $e^{(1.005(\text{pH})-5.134)}$	8.7 pH = 7.0	6.7 pH = 7.0	13	7.9	2.7 <u>0.3</u>	30 <u>0.4</u>
pH See 9VAC25-260-50						
Phenol (µg/l) 108952					10,000 <u>4,000</u>	860,000 <u>300,000</u>
Phosphorus Elemental (µg/l) 7723140				0.10		
Pyrene (µg/l) 129000					830 <u>20</u>	4,000 <u>30</u>
Radionuclides Gross Alpha Particle Activity (pCi/L) Beta Particle & Photon Activity (mrem/yr) (formerly man-made radionuclides) Combined Radium 226 and 228 (pCi/L) Uranium (µg/L)					15 4 5 30	

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
<p>Selenium (µg/l)⁵ 7782492</p> <p>WER shall not be used for freshwater acute and chronic criteria. Freshwater criteria expressed as total recoverable.</p>	20	5.0	290 X WER	71 X WER	170	4,200
<p>Silver (µg/l)⁵ 7440224</p> <p>Freshwater values are a function of total hardness as calcium carbonate (CaCO₃) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400.</p> <p>Freshwater acute criterion (µg/l) WER [e^{1.72[ln(hardness)]-6.52}] (CF_a)</p> <p>WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F</p> <p>e = natural antilogarithm ln=natural logarithm CF = conversion factor a (acute) or c (chronic) CF_a = 0.85</p>	3.4; CaCO ₃ = 100		1.9 X WER			

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Sulfate (µg/l) Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					250,000	
Temperature See 9VAC25-260-50						
<u>1,2,4,5-Tetrachlorobenzene</u> 95943					<u>0.03</u>	<u>0.03</u>
1,1,2,2-Tetrachloroethane (µg/l) 79345 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵)					4.7 <u>2.0</u>	40 <u>30</u>
Tetrachloroethylene (µg/l) 127184 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵)					6.9 <u>100</u>	33 <u>290</u>
Thallium (µg/l) 7440280					0.24	0.47
Toluene (µg/l) 108883					510 <u>57</u>	6,000 <u>520</u>
Total Dissolved Solids (µg/l) Criterion to maintain acceptable taste, odor or aesthetic quality of drinking water and applies at the drinking water intake.					500,000	

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Toxaphene (µg/l) 8001352 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .	0.73	0.0002	0.21	0.0002	0.0028 <u>0.0070</u>	0.0028 <u>0.0071</u>
Tributyltin (µg/l) 60105	0.46	0.072	0.42	0.0074		
1, 2, 4 Trichlorobenzene (µg/l) 120821 <u>Known or suspected carcinogen; human health criteria at risk level 10⁻⁵.</u>					35 <u>0.71</u>	70 <u>0.76</u>
<u>1,1,1-Trichloroethane</u> <u>71556</u>					<u>10,000</u>	<u>200,000</u>
1,1,2-Trichloroethane (µg/l) 79005 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					5.9 <u>5.5</u>	160 <u>89</u>
Trichloroethylene (µg/l) 79016 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					25 <u>6.0</u>	300 <u>70</u>
<u>2, 4, 5 –Trichlorophenol</u> <u>95954</u>					<u>300</u>	<u>600</u>

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PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
2, 4, 6 –Trichlorophenol 88062 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					14 <u>15</u>	24 <u>28</u>
2-(2, 4, 5 – Trichlorophenoxy propionic acid (Silvex) (µg/l) 93721					50	
Vinyl Chloride (µg/l) 75014 Known or suspected carcinogen; human health criteria at risk level 10 ⁻⁵ .					0.25 <u>0.22</u>	24 <u>16</u>

ATTACHMENT 2

PARAMETER CAS Number	USE DESIGNATION					
	AQUATIC LIFE				HUMAN HEALTH	
	FRESHWATER		SALTWATER		Public Water Supply ³	All Other Surface Waters ⁴
	Acute ¹	Chronic ²	Acute ¹	Chronic ²		
Zinc (µg/l) ⁵ 744066 Freshwater values are a function of total hardness as calcium carbonate (CaCO ₃) mg/l and the WER. The minimum hardness allowed for use in the equation below shall be 25 and the maximum, hardness shall be 400 even when the actual ambient hardness is less than 25 or greater than 400. Freshwater acute criterion µg/l WER [e ^{0.8473[ln(hardness)]+0.884}] (CF _a) Freshwater chronic criterion µg/l WER [e ^{0.8473[ln(hardness)]+0.884}] (CF _c) WER = Water Effect Ratio = 1 unless determined otherwise under 9VAC25-260-140 F e = base e exponential function. ln = log normal function CF _a = 0.978 CF _c = 0.986	120 CaCO ₃ = 100	120 CaCO ₃ = 100	90 X WER	81 X WER	7,400	26,000

¹One hour average concentration not to be exceeded more than once every 3 years on the average, unless otherwise noted.

²Four-day average concentration not to be exceeded more than once every 3 years on the average, unless otherwise noted.

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³Criteria have been calculated to protect human health from toxic effects through drinking water and fish consumption, unless otherwise noted and apply in segments designated as PWS in 9VAC25-260-390-540.

⁴Criteria have been calculated to protect human health from toxic effects through fish consumption, unless otherwise noted and apply in all other surface waters not designated as PWS in 9VAC25-260-390-540.

⁵Acute and chronic saltwater and freshwater aquatic life criteria apply to the biologically available form of the metal and apply as a function of the pollutant's water effect ratio (WER) as defined in 9VAC25-260-140 F (WER X criterion). Metals measured as dissolved shall be considered to be biologically available, or, because local receiving water characteristics may otherwise affect the biological availability of the metal, the biologically available equivalent measurement of the metal can be further defined by determining a Water Effect Ratio (WER) and multiplying the numerical value shown in 9VAC25-260-140 B by the WER. Refer to 9VAC25-260-140 F. Values displayed above in the table are examples and correspond to a WER of 1.0. Metals criteria have been adjusted to convert the total recoverable fraction to dissolved fraction using a conversion factor. Criteria that change with hardness have the conversion factor listed in the table above.

⁶The flows listed below are default design flows for calculating steady state waste load allocations unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

Aquatic Life:

Acute criteria	1Q10
Chronic criteria	7Q10
Chronic criteria (ammonia)	30Q10

Human Health:

Noncarcinogens	30Q5
Carcinogens	Harmonic mean

The following are defined for this section:

"1Q10" means the lowest flow averaged over a period of one day which on a statistical basis can be expected to occur once every 10 climatic years.

"7Q10" means the lowest flow averaged over a period of seven consecutive days that can be statistically expected to occur once every 10 climatic years.

"30Q5" means the lowest flow averaged over a period of 30 consecutive days that can be statistically expected to occur once every five climatic years.

"30Q10" means the lowest flow averaged over a period of 30 consecutive days that can be statistically expected to occur once every 10 climatic years.

"Averaged" means an arithmetic mean.

"Climatic year" means a year beginning on April 1 and ending on March 31.

⁷The criteria listed in this table are two significant digits. For other criteria that are referenced to other sections of this regulation in this table, all numbers listed as criteria values are significant.

⁸The fish tissue criterion for methylmercury applies to a concentration of 0.30 mg/kg as wet weight in edible tissue for species of fish and/or shellfish resident in a waterbody that are commonly eaten in the area and have commercial, recreational, or subsistence value.

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C. Application of freshwater and saltwater numerical criteria. The numerical water quality criteria listed in subsection B of this section (excluding dissolved oxygen, pH, temperature) shall be applied according to the following classes of waters (see 9VAC25-260-50) and boundary designations:

CLASS OF WATERS	NUMERICAL CRITERIA
I and II (Estuarine Waters)	Saltwater criteria apply
II (Transition Zone)	More stringent of either the freshwater or saltwater criteria apply
II (Tidal Freshwater), III, IV, V, VI and VII	Freshwater criteria apply

The following describes the boundary designations for Class II, (estuarine, transition zone and tidal freshwater waters) by river basin:

1. Rappahannock Basin. Tidal freshwater is from the fall line of the Rappahannock River to the upstream boundary of the transition zone including all tidal tributaries that enter the tidal freshwater Rappahannock River.

Transition zone upstream boundary – 38° 4' 56.59"/-76° 58' 47.93" (430 feet east of Hutchinson Swamp) to 38° 5' 23.33"/-76° 58' 24.39" (0.7 miles upstream of Peedee Creek).

Transition zone downstream boundary - 37° 58' 45.80"/-76° 55' 28.75" (1,000 feet downstream of Jenkins Landing) to 37° 59' 20.07/ -76° 53' 45.09" (0.33 miles upstream of Mulberry Point). All tidal waters that enter the transition zone are themselves transition zone waters.

Estuarine waters are from the downstream boundary of the transition zone to the mouth of the Rappahannock River (Buoy 6), including all tidal tributaries that enter the estuarine waters of the Rappahannock River.

2. York Basin. Tidal freshwater is from the fall line of the Mattaponi River at N37° 47' 20.03"/W77° 6' 15.16" (800 feet upstream of the Route 360 bridge in Aylett) to the upstream boundary of the Mattaponi River transition zone, and from the fall line of the Pamunkey River at N37° 41' 22.64" /W77° 12' 50.83" (2,000 feet upstream of Totopotomy Creek) to the upstream boundary of the Pamunkey River transition zone, including all tidal tributaries that enter the tidal freshwaters of the Mattaponi and Pamunkey Rivers.

Mattaponi River transition zone upstream boundary – N37° 39' 29.65"/W76° 52' 53.29" (1,000 feet upstream of Mitchell Hill Creek) to N37° 39' 24.20"/W76° 52' 55.87" (across from Courthouse Landing). Mattaponi River transition zone downstream boundary – N37° 32' 19.76"/W76° 47' 29.41" (old Lord Delaware Bridge, west side) to N37° 32' 13.25"/W76° 47' 10.30" (old Lord Delaware Bridge, east side).

Pamunkey River transition zone upstream boundary – N37° 32' 36.63"/W76° 58' 29.88" (Cohoke Marsh, 0.9 miles upstream of Turkey Creek) to N37° 32' 36.51"/W76° 58' 36.48" (0.75 miles upstream of creek at Cook Landing). Pamunkey River transition zone downstream boundary – N37° 31' 57.90"/ 76° 48' 38.22" (old Eltham Bridge, west side) to N37° 32' 6.25"/W76 48' 18.82" (old Eltham Bridge, east side).

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All tidal tributaries that enter the transition zones of the Mattaponi and Pamunkey Rivers are themselves in the transition zone.

Estuarine waters are from the downstream boundary of the transition zones of the Mattaponi and Pamunkey Rivers to the mouth of the York River (Tue Marsh Light) including all tidal tributaries that enter the estuarine waters of the York River.

3. James Basin. Tidal Freshwater is from the fall line of the James River in the City of Richmond upstream of Mayo Bridge to the upstream boundary of the transition zone, including all tidal tributaries that enter the tidal freshwater James River.

James River transition zone upstream boundary – N37° 14' 28.25"/W76° 56' 44.47" (at Tettington) to N37° 13' 38.56"/W76° 56' 47.13" 0.3 miles downstream of Sloop Point.

Chickahominy River transition zone upstream boundary – N37° 25' 44.79"/W77° 1' 41.76" (Holly Landing).

Transition zone downstream boundary – N37° 12' 7.23"/W76° 37' 34.70" (near Carters Grove Home, 1.25 downstream of Grove Creek) to N37° 9' 17.23"/W76° 40' 13.45" (0.7 miles upstream of Hunnicutt Creek). All tidal waters that enter the transition zone are themselves transition zone waters.

Estuarine waters are from the downstream transition zone boundary to the mouth of the James River (Buoy 25) including all tidal tributaries that enter the estuarine waters of the James River.

4. Potomac Basin. Tidal Freshwater includes all tidal tributaries that enter the Potomac River from its fall line at the Chain Bridge (N38° 55' 46.28"/W77° 6' 59.23") to the upstream transition zone boundary near Quantico, Virginia.

Transition zone includes all tidal tributaries that enter the Potomac River from N38° 31' 27.05"/W77° 17' 7.06" (midway between Shipping Point and Quantico Pier) to N38° 23' 22.78"/W77° 1' 45.50" (one mile southeast of Mathias Point).

Estuarine waters includes all tidal tributaries that enter the Potomac River from the downstream transition zone boundary to the mouth of the Potomac River (Buoy 44B).

5. Chesapeake Bay, Atlantic Ocean, and small coastal basins. Estuarine waters include the Atlantic Ocean tidal tributaries, and the Chesapeake Bay and its small coastal basins from the Virginia state line to the mouth of the bay (a line from Cape Henry drawn through Buoys 3 and 8 to Fishermans Island), and its tidal tributaries, excluding the Potomac tributaries and those tributaries listed above.

6. Chowan River Basin. Tidal freshwater includes the Northwest River and its tidal tributaries from the Virginia-North Carolina state line to the free flowing portion, the Blackwater River and its tidal tributaries from the Virginia-North Carolina state line to the end of tidal waters at approximately state route 611 at river mile 20.90, the Nottoway River and its tidal tributaries from the Virginia-North Carolina state line to the end of tidal waters at approximately Route 674, and the North Landing River and its tidal tributaries from the Virginia-North Carolina state line to the Great Bridge Lock.

Transition zone includes Back Bay and its tributaries in the City of Virginia Beach to the Virginia-North Carolina state line.

D. Site-specific modifications to numerical water quality criteria.

1. The board may consider site-specific modifications to numerical water quality criteria in subsection B of this section where the applicant or permittee demonstrates that the alternate numerical water quality criteria are sufficient to protect all designated uses (see 9VAC25-260-10) of that particular surface water segment or body.

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2. Any demonstration for site-specific human health criteria shall be restricted to a reevaluation of the bioconcentration or bioaccumulation properties of the pollutant. The exceptions to this restriction are for site-specific criteria for taste, odor, and aesthetic compounds noted by double asterisks in subsection B of this section and nitrates.
3. Procedures for promulgation and review of site-specific modifications to numerical water quality criteria resulting from subdivisions 1 and 2 of this subsection.
 - a. Proposals describing the details of the site-specific study shall be submitted to the board's staff for approval prior to commencing the study.
 - b. Any site-specific modification shall be promulgated as a regulation in accordance with the Administrative Process Act. All site-specific modifications shall be listed in 9VAC25-260-310 (Special standards and requirements).

E. Variances to water quality standards.

1. A variance from numeric criteria may be granted to a discharger if it can be demonstrated that one or more of the conditions in 9VAC25-260-10 H limit the attainment of one or more specific designated uses.
 - a. Variances shall apply only to the discharger to whom they are granted and shall be reevaluated and either continued, modified or revoked at the time of permit issuance. At that time the permittee shall make a showing that the conditions for granting the variance still apply.
 - b. Variances shall be described in the public notice published for the permit. The decision to approve a variance shall be subject to the public participation requirements of the Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulation, 9VAC25-31 (Permit Regulation).
 - c. Variances shall not prevent the maintenance and protection of existing uses or exempt the discharger or regulated activity from compliance with other appropriate technology or water quality-based limits or best management practices.
 - d. Variances granted under this section shall not apply to new discharges.
 - e. Variances shall be submitted by the department's Division of Scientific Research or its successors to the Environmental Protection Agency for review and approval/disapproval.
 - f. A list of variances granted shall be maintained by the department's Division of Scientific Research or its successors.
2. None of the variances in this subsection shall apply to the halogen ban section (9VAC25-260-110) or temperature criteria in 9VAC25-260-50 if superseded by § 316(a) of the Clean Water Act requirements. No variances in this subsection shall apply to the criteria that are designed to protect human health from carcinogenic and noncarcinogenic toxic effects (subsection B of this section) with the exception of the metals, and the taste, odor, and aesthetic compounds noted by double asterisks and nitrates, listed in subsection B of this section.

F. Water effect ratio.

1. A water effects ratio (WER) shall be determined by measuring the effect of receiving water (as it is or will be affected by any discharges) on the bioavailability or toxicity of a metal by using standard test organisms and a metal to conduct toxicity tests simultaneously in receiving water and laboratory water. The ratio of toxicities of the metal(s) in the two waters is the WER (toxicity in receiving water divided by toxicity in

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laboratory water = WER). Once an acceptable WER for a metal is established, the numerical value for the metal in subsection B of this section is multiplied by the WER to produce an instream concentration that will protect designated uses. This instream concentration shall be utilized in permitting decisions.

2. The WER shall be assigned a value of 1.0 unless the applicant or permittee demonstrates to the department's satisfaction in a permit proceeding that another value is appropriate, or unless available data allow the department to compute a WER for the receiving waters. The applicant or permittee is responsible for proposing and conducting the study to develop a WER. The study may require multiple testing over several seasons. The applicant or permittee shall obtain the department's Division of Scientific Research or its successor approval of the study protocol and the final WER.

3. The Permit Regulation at 9VAC25-31-230 C requires that permit limits for metals be expressed as total recoverable measurements. To that end, the study used to establish the WER may be based on total recoverable measurements of the metals.

4. The Environmental Protection Agency views the WER in any particular case as a site-specific criterion. Therefore, the department's Division of Scientific Research or its successor shall submit the results of the study to the Environmental Protection Agency for review and approval/disapproval within 30 days of the receipt of certification from the state's Office of the Attorney General. Nonetheless, the WER is established in a permit proceeding, shall be described in the public notice associated with the permit proceeding, and applies only to the applicant or permittee in that proceeding. The department's action to approve or disapprove a WER is a case decision, not an amendment to the present regulation.

The decision to approve or disapprove a WER shall be subject to the public participation requirements of the Permit Regulation, 9VAC25-31-260 et seq. A list of final WERs will be maintained by the department's Division of Scientific Research or its successor.

5. A WER shall not be used for the freshwater and saltwater chronic mercury criteria or the freshwater acute and chronic selenium criteria.

9VAC25-260-155. Ammonia surface water quality criteria.

A. The Department of Environmental Quality, after consultation with the Virginia Department of Game and Inland Fisheries and the U.S. Fish and Wildlife Service, has determined that the majority of Virginia freshwaters are likely to contain, or have contained in the past, freshwater mussel species in the family Unionidae and contain early life stages of fish during most times of the year. Therefore, the ammonia criteria presented in subsections B and C of this section are designed to provide protection to these species and life stages. In an instance where it can be adequately demonstrated that either freshwater mussels or early life stages of fish are not present in a specific waterbody, potential options for alternate, site-specific criteria are presented in subsection D of this section. Acute criteria are a one-hour average concentration not to be exceeded more than once every three years¹ on the average, and chronic criteria are 30-day average concentrations not to be exceeded more than once every three years on the average².

A. ~~B.~~ The one-hour average concentration of total ammonia nitrogen (in mg N/L) in freshwater shall not exceed, more than once every three years on the average⁴, the acute criteria for total ammonia (in mg N/L) for freshwaters with trout absent or present are below:

Acute Ammonia Freshwater CriteriaTotal Ammonia Nitrogen (mg N/L)

pH	Trout Present	Trout Absent
6.5	32.6	48.8
6.6	31.3	46.8
6.7	29.8	44.6
6.8	28.1	42.0
6.9	26.2	39.4
7.0	24.1	36.4
7.1	22.0	32.8
7.2	19.7	29.5
7.3	17.5	26.2
7.4	15.4	23.0
7.5	13.3	19.9
7.6	11.4	17.0
7.7	9.65	14.4
7.8	8.11	12.1
7.9	6.77	10.1
8.0	5.62	8.40
8.1	4.64	6.95
8.2	3.83	5.72
8.3	3.15	4.71
8.4	2.59	3.88
8.5	2.14	3.20
8.6	1.77	2.65
8.7	1.47	2.20

8.8	1.23	1.84
8.9	1.04	1.56
9.0	0.885	1.32

Acute Ammonia Freshwater Criteria
 Total Ammonia Nitrogen (mg N/L)

TROUT ABSENT

Temperature (°C)																					
pH	0-10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	51	48	44	41	37	34	32	29	27	25	23	21	19	18	16	15	14	13	12	11	9.9
6.6	49	46	42	39	36	33	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9.5
6.7	46	44	40	37	34	31	29	27	24	22	21	19	18	16	15	14	13	12	11	9.8	9.0
6.8	44	41	38	35	32	30	27	25	23	21	20	18	17	15	14	13	12	11	10	9.2	8.5
6.9	41	38	35	32	30	28	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9
7.0	38	35	33	30	28	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9	7.3
7.1	34	32	30	27	25	23	21	20	18	17	15	14	13	12	11	10	9.3	8.5	7.9	7.2	6.7
7.2	31	29	27	25	23	21	19	18	16	15	14	13	12	11	9.8	9.1	8.3	7.7	7.1	6.5	6.0
7.3	27	26	24	22	20	18	17	16	14	13	12	11	10	9.5	8.7	8.0	7.4	6.8	6.3	5.8	5.3
7.4	24	22	21	19	18	16	15	14	13	12	11	9.8	9.0	8.3	7.7	7.0	6.5	6.0	5.5	5.1	4.7
7.5	21	19	18	17	15	14	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0
7.6	18	17	15	14	13	12	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	15	14	13	12	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	2.9
7.8	13	12	11	10	9.3	8.5	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.2	2.9	2.7	2.5
7.9	11	9.9	9.1	8.4	7.7	7.1	6.6	3.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	8.8	8.2	7.6	7.0	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7
8.1	7.2	6.8	6.3	5.8	5.3	4.9	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
8.2	6.0	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	4.9	4.6	4.3	3.9	3.6	3.3	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.96
8.4	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79
8.5	3.3	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	0.98	0.90	0.83	0.77	0.71	0.65
8.6	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.5	1.3	1.2	1.1	1.0	0.96	0.88	0.81	0.75	0.69	0.63	0.58	0.54
8.7	2.3	2.2	2.0	1.8	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.94	0.87	0.80	0.74	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.32
9.0	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

Acute Ammonia Freshwater Criteria
Total Ammonia Nitrogen (mg N/L)

TROUT PRESENT

Temperature (°C)

pH	0-14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	33	33	32	29	27	25	23	21	19	18	16	15	14	13	12	11	9.9
6.6	31	31	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9.5
6.7	30	30	29	27	24	22	21	19	18	16	15	14	13	12	11	9.8	9.0
6.8	28	28	27	25	23	21	20	18	17	15	14	13	12	11	10	9.2	8.5
6.9	26	26	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9
7.0	24	24	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	8.0	7.3
7.1	22	22	21	20	18	17	15	14	13	12	11	10	9.3	8.5	7.9	7.2	6.7
7.2	20	20	19	18	16	15	14	13	12	11	9.8	9.1	8.3	7.7	7.1	6.5	6.0
7.3	18	18	17	16	14	13	12	11	10	9.5	8.7	8.0	7.4	6.8	6.3	5.8	5.3
7.4	15	15	15	14	13	12	11	9.8	9.0	8.3	7.7	7.0	6.5	6.0	5.5	5.1	4.7
7.5	13	13	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0
7.6	11	11	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	9.6	9.6	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	3.0
7.8	8.1	8.1	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.2	2.9	2.7	2.5
7.9	6.8	6.8	6.6	6.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	5.6	5.6	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7
8.1	4.6	4.6	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
8.2	3.8	3.8	3.7	3.5	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	3.1	3.1	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	0.96
8.4	2.6	2.6	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.93	0.86	0.79
8.5	2.1	2.1	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	0.98	0.90	0.83	0.77	0.71	0.65
8.6	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.1	1.0	0.96	0.88	0.81	0.75	0.69	0.63	0.59	0.54
8.7	1.5	1.5	1.4	1.3	1.2	1.1	1.0	0.94	0.87	0.80	0.74	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.2	1.2	1.2	1.1	1.0	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.0	1.0	1.0	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.32
9.0	0.88	0.88	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

The acute criteria for trout present shall apply to all Class V-Stockable Trout Waters and Class VI-Natural Trout Waters as listed in 9VAC25-260-390 through 9VAC25-260-540. The acute criteria for trout absent apply to all other fresh waters.

To calculate total ammonia nitrogen acute criteria values in freshwater at different pH values than those listed in this subsection, use the following formulas equations and round the result to two significant digits:

Where trout are present absent:

Acute Criterion Concentration (mg N/L) =

$$\frac{0.275}{(1 + 10^{7.204-pH})} + \frac{39.0}{(1 + 10^{pH-7.204})}$$

$$0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204-pH}} \pm \frac{1.6181}{1 + 10^{pH-7.204}} \right) \times \text{MIN}$$

Where MIN = 51.93 or 23.12 X 10^{0.036 X (20 - T)}, whichever is less.

T = Temperature in °C

Or where trout are absent present, whichever of the below calculation results is less:

Acute Criterion Concentration (mg N/L) =

$$\frac{0.411}{(1 + 10^{7.204-pH})} + \frac{58.4}{(1 + 10^{pH-7.204})}$$

$$\left[\left(\frac{0.275}{1 + 10^{7.204-pH}} \pm \frac{39.0}{1 + 10^{pH-7.204}} \right) \right]$$

Or

$$0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204-pH}} \pm \frac{1.6181}{1 + 10^{pH-7.204}} \right) \times (23.12 \times 10^{0.036 \times (20 - T)})$$

T = Temperature in °C

¹The default design flow for calculating steady state waste load allocations for the acute ammonia criterion is the 1Q10 (see 9VAC25-260-140 B footnote 10) unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

B. [C.] The 30-day average concentration of chronic criteria for total ammonia nitrogen (in mg N/L) where freshwater mussels and early life stages of fish are present in freshwater shall not exceed, more than once every three years on the average², the chronic criteria are below:

Chronic Ammonia Freshwater Criteria
 Early Life Stages of Fish Present
 Total Ammonia Nitrogen (mg N/L)

pH	Temperature (°C)									
	0	14	16	18	20	22	24	26	28	30
6.5	6.67	6.67	6.06	5.33	4.68	4.12	3.62	3.18	2.80	2.46
6.6	6.57	6.57	5.97	5.25	4.61	4.05	3.56	3.13	2.75	2.42
6.7	6.44	6.44	5.86	5.15	4.52	3.98	3.50	3.07	2.70	2.37
6.8	6.29	6.29	5.72	5.03	4.42	3.89	3.42	3.00	2.64	2.32
6.9	6.12	6.12	5.56	4.89	4.30	3.78	3.32	2.92	2.57	2.25

7.0	5.91	5.91	5.37	4.72	4.15	3.65	3.21	2.82	2.48	2.18
7.1	5.67	5.67	5.15	4.53	3.98	3.50	3.08	2.70	2.38	2.09
7.2	5.39	5.39	4.90	4.31	3.78	3.33	2.92	2.57	2.26	1.99
7.3	5.08	5.08	4.61	4.06	3.57	3.13	2.76	2.42	2.13	1.87
7.4	4.73	4.73	4.30	3.78	3.32	2.92	2.57	2.26	1.98	1.74
7.5	4.36	4.36	3.97	3.49	3.06	2.69	2.37	2.08	1.83	1.61
7.6	3.98	3.98	3.61	3.18	2.79	2.45	2.16	1.90	1.67	1.47
7.7	3.58	3.58	3.25	2.86	2.51	2.21	1.94	1.71	1.50	1.32
7.8	3.18	3.18	2.89	2.54	2.23	1.96	1.73	1.52	1.33	1.17
7.9	2.80	2.80	2.54	2.24	1.96	1.73	1.52	1.33	1.17	1.03
8.0	2.43	2.43	2.21	1.94	1.71	1.50	1.32	1.16	1.02	0.897
8.1	2.10	2.10	1.91	1.68	1.47	1.29	1.14	1.00	0.879	0.773
8.2	1.79	1.79	1.63	1.43	1.26	1.11	0.973	0.855	0.752	0.661
8.3	1.52	1.52	1.39	1.22	1.07	0.941	0.827	0.727	0.639	0.562
8.4	1.29	1.29	1.17	1.03	0.906	0.796	0.700	0.615	0.541	0.475
8.5	1.09	1.09	0.990	0.870	0.765	0.672	0.591	0.520	0.457	0.401
8.6	0.920	0.920	0.836	0.735	0.646	0.568	0.499	0.439	0.386	0.339
8.7	0.778	0.778	0.707	0.622	0.547	0.480	0.422	0.371	0.326	0.287
8.8	0.661	0.661	0.601	0.528	0.464	0.408	0.359	0.315	0.277	0.244
8.9	0.565	0.565	0.513	0.451	0.397	0.349	0.306	0.269	0.237	0.208
9.0	0.486	0.486	0.442	0.389	0.342	0.300	0.264	0.232	0.204	0.179

Chronic Ammonia Freshwater Criteria
 Mussels and Early Life Stages of Fish Present
 Total Ammonia Nitrogen (mg N/L)

Temperature (°C)																								
pH	0-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	4.9	4.6	4.3	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.2	1.1
6.6	4.8	4.5	4.3	4.0	3.8	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1
6.7	4.8	4.5	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1
6.8	4.6	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1
6.9	4.5	4.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0
7.0	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	0.99
7.1	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95
7.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90
7.3	3.8	3.5	3.3	3.1	2.9	2.7	2.6	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.97	0.91	0.85
7.4	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90	0.85	0.79
7.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.83	0.78	0.73
7.6	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.1	0.98	0.92	0.86	0.81	0.76	0.71	0.67
7.7	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60
7.8	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53
7.9	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47
8.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60	0.56	0.53	0.50	0.44	0.44	0.41
8.1	1.5	1.5	1.4	1.3	1.2	1.1	1.1	0.99	0.92	0.87	0.81	0.76	0.71	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35
8.2	1.3	1.2	1.2	1.1	1.0	0.96	0.90	0.84	0.79	0.74	0.70	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30
8.3	1.1	1.1	0.99	0.93	0.87	0.82	0.76	0.72	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26
8.4	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.32	0.30	0.28	0.26	0.25	0.23	0.22
8.5	0.80	0.75	0.71	0.67	0.62	0.58	0.55	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.24	0.22	0.21	0.20	0.18
8.6	0.68	0.64	0.60	0.56	0.53	0.49	0.46	0.43	0.41	0.38	0.36	0.33	0.31	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.16	0.15
8.7	0.57	0.54	0.51	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13
8.8	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.11
8.9	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.10	0.09
9.0	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08

To calculate total ammonia nitrogen chronic criteria values in freshwater when ~~fish~~ freshwater mussels and early life stages of fish are present at different pH and temperature values than those listed in this subsection, use the following ~~formulas~~ equation and round the result to two significant digits:

Chronic Criteria Concentration =

$$\left(\frac{0.0577}{(1 + 10^{7.688 - \text{pH}})} + \frac{2.487}{(1 + 10^{\text{pH} - 7.688})} \right) \times \text{MIN}$$

Where MIN = 2.85 or $1.45 \times 10^{0.028(25 - T)}$, whichever is less.

$$0.8876 \times \left(\frac{0.0278}{1 + 10^{7.688 - \text{pH}}} \pm \frac{1.1994}{1 + 10^{\text{pH} - 7.688}} \right) \times (2.126 \times 10^{0.028 \times (20 - \text{MAX}(T, 7))})$$

Where MAX = 7 or temperature in degrees Celsius, whichever is greater.

T = temperature in °C

~~²The default design flow for calculating steady state waste load allocations for the chronic ammonia criterion where early life stages of fish are present is the 30Q10 (see 9VAC25-260-140 B footnote 10) unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.~~

D. Site-specific considerations and alternate criteria. If it can be adequately demonstrated that freshwater mussels or early life stages of fish are not present at a site, then alternate site-specific criteria can be considered using the information provided in this subsection. Recalculated site-specific criteria shall provide for the attainment and maintenance of the water quality standards of downstream waters.

1. Site-specific modifications to the ambient water quality criteria for ammonia to account for the absence of freshwater mussels or early life stages of fish shall be conducted in accordance with the procedures contained in this subdivision. Because the department presumes that most state waterbodies have freshwater mussels and early life stages of fish present during most times of the year, the criteria shall be calculated assuming freshwater mussels and early life stages of fish are present using subsections B and C of this section unless the following demonstration that freshwater mussels or early life stages of fish are absent is successfully completed. Determination of the absence of freshwater mussels requires special field survey methods. This determination must be made after an adequate survey of the waterbody is conducted by an individual certified by the Virginia Department of Game and Inland Fisheries (DGIF) for freshwater mussel identification and surveys. Determination of absence of freshwater mussels will be done in consultation with the DGIF. Early life stages of fish are defined in subdivision 2 of this subsection. Modifications to the ambient water quality criteria for ammonia based on the presence or absence of early life stages of fish shall only apply at temperatures below 15°C.

a. During the review of any new or existing activity that has a potential to discharge ammonia in amounts that may cause or contribute to a violation of the ammonia criteria contained in subsection B of this section, the department may examine data from the following approved sources in subdivisions 1 a (1) through (5) of this subsection or may require the gathering of data in accordance with subdivisions 1 a (1) through (5) on the presence or absence of early life stages of fish in the affected waterbody.

(1) Species and distribution data contained in the Virginia Department of Game and Inland Fisheries Wildlife Information System database.

(2) Species and distribution data contained in Freshwater Fishes of Virginia, 1994.

(3) Data and fish species distribution maps contained in Handbook for Fishery Biology, Volume 3, 1997.

(4) Field data collected in accordance with U.S. EPA's Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers, Second Edition, EPA 841-B-99-002. Field data must comply with all quality assurance and quality control criteria.

(5) The American Society for Testing and Materials (ASTM) Standard E-1241-88, Standard Guide for Conducting Early Life-Stage Toxicity Tests with Fishes.

b. If data or information from sources other than subdivisions 1 a (1) through (5) of this subsection are considered, then any resulting site-specific criteria modifications shall be reviewed and adopted in accordance with the site-specific criteria provisions in 9VAC25-260-140 D, and submitted to EPA for review and approval.

c. If the department determines that the data and information obtained from subdivisions 1 a (1) through (5) of this subsection demonstrate that there are periods of each year when no early life stages are expected to be present for any species of fish that occur at the site, the department shall issue a notice to the public and make available for public comment the supporting data and analysis along with the

department's preliminary decision to authorize the site-specific modification to the ammonia criteria. Such information shall include, at a minimum:

(1) Sources of data and information.

(2) List of fish species that occur at the site as defined in subdivision 3 of this subsection.

(3) Definition of the site. Definition of a "site" can vary in geographic size from a stream segment to a watershed to an entire eco-region.

(4) Duration of early life stage for each species in subdivision 1 c (2) of this subsection.

(5) Dates when early life stages of fish are expected to be present for each species in subdivision 1 c (2) of this subsection.

(6) Based on subdivision 1 c (5) of this subsection, identify the dates (beginning date, ending date), if any, where no early life stages are expected to be present for any of the species identified in subdivision 1 c (2) of this subsection.

d. If, after reviewing the public comments received in subdivision 1 c of this subsection and supporting data and information, the department determines that there are times of the year where no early life stages are expected to be present for any fish species that occur at the site, then the applicable ambient water quality criteria for ammonia for those time periods shall be calculated using the table in this subsection, or the formula for calculating the chronic criterion concentration for ammonia when early life stages of fish are absent.

e. The department shall maintain a comprehensive list of all sites where the department has determined that early life stages of fish are absent. For each site the list will identify the waterbodies affected and the corresponding times of the year that early life stages of fish are absent. This list is available either upon request from the Office of Water Quality Programs at 629 East Main Street, Richmond, VA 23219, or from the department website at <http://www.deq.virginia.gov/programs/water/waterqualityinformationtmdls/waterqualitystandards.aspx>.

2. The duration of the "early life stages" extends from the beginning of spawning through the end of the early life stages. The early life stages include the pre-hatch embryonic period, the post-hatch free embryo or yolk-sac fry, and the larval period, during which the organism feeds. Juvenile fish, which are anatomically similar to adults, are not considered an early life stage. The duration of early life stages can vary according to fish species. The department considers the sources of information in subdivisions 1 a (1) through (5) of this subsection to be the only acceptable sources of information for determining the duration of early life stages of fish under this procedure.

3. "Occur at the site" includes the species, genera, families, orders, classes, and phyla that are usually present at the site; are present at the site only seasonally due to migration; are present intermittently because they periodically return to or extend their ranges into the site; or were present at the site in the past or are present in nearby bodies of water, but are not currently present at the site due to degraded conditions, and are expected to return to the site when conditions improve. "Occur at the site" does not include taxa that were once present at the site but cannot exist at the site now due to permanent physical alteration of the habitat at the site.

4. Any modifications to ambient water quality criteria for ammonia in subdivision 1 of this subsection shall not likely jeopardize the continued existence of any federal or state

listed, threatened, or endangered species or result in the destruction or adverse modification of such species' critical habitats.

5. Site-specific modifications to the ambient water quality criteria for ammonia to account for the absence of freshwater mussels shall be conducted in accordance with the procedures contained in this subdivision. Because the department presumes that most state waterbodies have freshwater mussel species, the criteria shall be calculated assuming mussels are present using subsections B and C of this section unless the demonstration that freshwater mussels are absent is successfully completed and accepted by DEQ and DGIF.

6. Equations for calculating ammonia criteria for four different site-specific scenarios are provided below as follows: (i) acute criteria when mussels are absent but trout are present, (ii) acute criteria when mussels and trout are absent, (iii) chronic criteria when mussels are absent and early life stages of fish are present, and (iv) chronic criteria when mussels and early life stages of fish are absent. Additional information regarding site-specific criteria can be reviewed in appendix N (pages 225-242) of the EPA Aquatic Life Ambient Water Quality Criteria to Ammonia--Freshwater 2013 (EPA 822-R-13-001).

a. Acute criteria: freshwater mussels absent and trout present.

To calculate total ammonia nitrogen acute criteria values (in mg N/L) in freshwater with freshwater mussels absent (procedures for making this determination are in subdivisions 1 through 5 of this subsection) and trout present, use the equations below. The acute criterion is the lesser of the calculation results below. Round the result to two significant digits.

$$\left(\frac{0.275}{1 + 10^{7.204 - \text{pH}}} \pm \frac{39}{1 + 10^{\text{pH} - 7.204}} \right)$$

Or

$$0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204 - \text{pH}}} \pm \frac{1.6181}{1 + 10^{\text{pH} - 7.204}} \right) \times (62.15 \times 10^{0.036 \times (20 - T)})$$

b. Acute criteria: freshwater mussels absent and trout absent.

To calculate total ammonia nitrogen acute criteria values (in mg N/L) in freshwater where freshwater mussels are absent and trout are absent, use the following equation. Round the result to two significant digits.

$$0.7249 \times \left(\frac{0.0114}{1 + 10^{7.204 - \text{pH}}} \pm \frac{1.6181}{1 + 10^{\text{pH} - 7.204}} \right) \times \text{MIN}$$

Where MIN = 51.93 or $62.15 \times 10^{0.036 \times (20 - T)}$, whichever is less.

T = Temperature in °C.

c. Chronic criteria: freshwater mussels absent and early life stages of fish present.

C. The 30-day average concentration of The chronic criteria for total ammonia nitrogen (in mg N/L) where early life stages of fish freshwater mussels are absent (procedures for making this determination are in subdivisions 1 through 4 5 of this subsection) in freshwater shall not exceed , more than once every three years on the average³, the chronic criteria concentration values calculated using the equation below ∴. Round the result to two significant digits.

Chronic Ammonia Freshwater Criteria
 Early Life Stages of Fish Absent
 Total Ammonia Nitrogen (mg N/L)

pH	Temperature (°C)									
	0-7	8	9	10	11	12	13	14	15	16
6.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46	6.06
6.6	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79	6.36	5.97
6.7	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66	6.25	5.86
6.8	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51	6.10	5.72
6.9	9.93	9.34	8.73	8.19	7.68	7.20	6.75	6.33	5.93	5.56
7.0	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11	5.73	5.37
7.1	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86	5.49	5.15
7.2	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57	5.22	4.90
7.3	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25	4.92	4.61
7.4	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89	4.59	4.30
7.5	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51	4.23	3.97
7.6	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11	3.85	3.61
7.7	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70	3.47	3.25
7.8	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89
7.9	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89	2.71	2.54
8.0	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52	2.36	2.21
8.1	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17	2.03	1.91
8.2	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85	1.74	1.63
8.3	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48	1.39
8.4	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17
8.5	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.06	0.990
8.6	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951	0.892	0.836
8.7	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805	0.754	0.707
8.8	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684	0.641	0.601
8.9	0.917	0.860	0.806	0.756	0.709	0.664	0.623	0.584	0.548	0.513
9.0	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503	0.471	0.442

At 15°C and above, the criterion for fish early life stages absent is the same as the criterion for fish early life stages present.

To calculate total ammonia nitrogen chronic criteria values in freshwater when fish early life stages are absent at different pH and temperature values than those listed in this subsection, use the following formulas:

Chronic Criteria Concentration =

$$\left(\frac{0.0577}{(1 + 10^{7.688 - \text{pH}})} + \frac{2.487}{(1 + 10^{\text{pH} - 7.688})} \right) \times 1.45(10^{0.028(25 - \text{MAX})})$$

MAX = temperature in °C or 7, whichever is greater.

$$0.9405 \times \left(\frac{0.0278}{1 + 10^{7.688 - \text{pH}}} \pm \frac{1.1994}{1 + 10^{\text{pH} - 7.688}} \right) \times \text{MIN}$$

Where MIN = 6.920 or $7.547 \times 10^{0.028 \times (20 - T)}$ whichever is less

T = temperature in °C

³The default design flow for calculating steady state waste load allocations for the chronic ammonia criterion where early life stages of fish are absent is the 30Q10 (see 9VAC25-260-140 B footnote 10) unless statistically valid methods are employed that demonstrate compliance with the duration and return frequency of the water quality criteria.

1. Site-specific modifications to the ambient water quality criteria for ammonia to account for the absence of early life stages of fish shall be conducted in accordance with the procedures contained in this subdivision. Because the department presumes that most state waterbodies have early life stages of fish present during most times of the year, the criteria shall be calculated assuming early life stages of fish are present using subsection B of this section unless the following demonstration that early life stages are absent is successfully completed. Early life stages of fish are defined in subdivision 2 of this subsection. Modifications to the ambient water quality criteria for ammonia based on the presence or absence of early life stages of fish shall only apply at temperatures below 15°C.

a. During the review of any new or existing activity that has a potential to discharge ammonia in amounts that may cause or contribute to a violation of the ammonia criteria contained in subsection B of this section, the department may examine data from the following approved sources in subdivisions 1 a (1) through (5) of this subsection or may require the gathering of data in accordance with subdivisions 1 a (1) through (5) on the presence or absence of early life stages of fish in the affected waterbody.

(1) Species and distribution data contained in the Virginia Department of Game and Inland Fisheries Wildlife Information System database.

(2) Species and distribution data contained in Freshwater Fishes of Virginia, 1994.

(3) Data and fish species distribution maps contained in Handbook for Fishery Biology, Volume 3, 1997.

(4) Field data collected in accordance with U.S. EPA's Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers, Second Edition, EPA 841-B-99-002. Field data must comply with all quality assurance/quality control criteria.

(5) The American Society for Testing and Materials (ASTM) Standard E-1241-88, Standard Guide for Conducting Early Life-Stage Toxicity Tests with Fishes.

b. If data or information from sources other than subdivisions 1 a (1) through (5) of this subsection are considered, then any resulting site-specific criteria modifications shall be reviewed and adopted in accordance with the site-specific criteria provisions in 9VAC25-260-140 D, and submitted to EPA for review and approval.

c. If the department determines that the data and information obtained from subdivisions 1 a (1) through (5) of this subsection demonstrate that there are periods

- ~~of each year when no early life stages are expected to be present for any species of fish that occur at the site, the department shall issue a notice to the public and make available for public comment the supporting data and analysis along with the department's preliminary decision to authorize the site-specific modification to the ammonia criteria. Such information shall include, at a minimum:~~
- ~~(1) Sources of data and information.~~
 - ~~(2) List of fish species that occur at the site as defined by subdivision 3 of this subsection.~~
 - ~~(3) Definition of the site. Definition of a "site" can vary in geographic size from a stream segment to a watershed to an entire eco-region.~~
 - ~~(4) Duration of early life stage for each species in subdivision 1 c (2) of this subsection.~~
 - ~~(5) Dates when early life stages of fish are expected to be present for each species in subdivision 1 c (2) of this subsection.~~
 - ~~(6) Based on subdivision 1 c (5) of this subsection, identify the dates (beginning date, ending date), if any, where no early life stages are expected to be present for any of the species identified in subdivision 1 c (2) of this subsection.~~
- ~~d. If, after reviewing the public comments received in subdivision 1 c of this subsection and supporting data and information, the department determines that there are times of the year where no early life stages are expected to be present for any fish species that occur at the site, then the applicable ambient water quality criteria for ammonia for those time periods shall be calculated using the table in this subsection, or the formula for calculating the chronic criterion concentration for ammonia when fish early life stages are absent.~~
- ~~e. The department shall maintain a comprehensive list of all sites where the department has determined that early life stages of fish are absent. For each site the list will identify the waterbodies affected and the corresponding times of the year that early life stages are absent. This list is available either upon request from the Office of Water Quality Programs at P.O. Box 1105, Richmond, Virginia 23218 or from the department website <http://www.deq.virginia.gov/wqs>.~~
- ~~2. The duration of the "early life stages" extends from the beginning of spawning through the end of the early life stages. The early life stages include the pre-hatch embryonic period, the post-hatch free embryo or yolk-sac fry, and the larval period, during which the organism feeds. Juvenile fish, which are anatomically similar to adults, are not considered an early life stage. The duration of early life stages can vary according to fish species. The department considers the sources of information in subdivisions 1 a (1) through (5) of this subsection to be the only acceptable sources of information for determining the duration of early life stages of fish under this procedure.~~
- ~~3. "Occur at the site" includes the species, genera, families, orders, classes, and phyla that: are usually present at the site; are present at the site only seasonally due to migration; are present intermittently because they periodically return to or extend their ranges into the site; were present at the site in the past or are present in nearby bodies of water, but are not currently present at the site due to degraded conditions, and are expected to return to the site when conditions improve. "Occur at the site" does not include taxa that were once present at the site but cannot exist at the site now due to permanent physical alteration of the habitat at the site.~~
- ~~4. Any modifications to ambient water quality criteria for ammonia in subdivision 1 of this subsection shall not likely jeopardize the continued existence of any federal or state~~

~~listed, threatened or endangered species or result in the destruction or adverse modification of such species' critical habitat.~~

d. Chronic criteria: freshwater mussels absent and early life stages of fish absent.

The chronic criteria for total ammonia nitrogen (in mg N/L) where freshwater mussels are absent and early life stages of fish are absent (procedures for making this determination are in subdivisions 1 through 5 of this subsection in freshwater shall not exceed concentration values calculated using the equation below. Round the result to two significant digits.

$$0.9405 \times \left(\frac{0.0278}{1 + 10^{7.688 - \text{pH}}} \pm \frac{1.1994}{1 + 10^{\text{pH} - 7.688}} \right) \times (7.547 \times 10^{0.028 \times (20 - \text{MAX}(T,7))})$$

Where MAX = 7 or temperature in degrees Celsius, whichever is greater.

T = temperature in °C

~~D. E.~~ The one-hour average concentration of total ammonia nitrogen (in mg N/L) in saltwater shall not exceed, more than once every three years on the average, the acute criteria below:

Acute Ammonia Saltwater Criteria
Total Ammonia Nitrogen (mg N/L)
Salinity = 10 g/kg

pH	Temperature °C							
	0	5	10	15	20	25	30	35
7.00	231.9	159.8	110.1	75.88	52.31	36.08	24.91	17.21
7.20	146.4	100.9	69.54	47.95	33.08	22.84	15.79	10.93
7.40	92.45	63.73	43.94	30.32	20.94	14.48	10.03	6.97
7.60	58.40	40.28	27.80	19.20	13.28	9.21	6.40	4.47
7.80	36.92	25.48	17.61	12.19	8.45	5.88	4.11	2.89
8.00	23.37	16.15	11.18	7.76	5.40	3.78	2.66	1.89
8.20	14.81	10.26	7.13	4.97	3.48	2.46	1.75	1.27
8.40	9.42	6.54	4.57	3.20	2.27	1.62	1.18	0.87
8.60	6.01	4.20	2.95	2.09	1.50	1.09	0.81	0.62
8.80	3.86	2.72	1.93	1.39	1.02	0.76	0.58	0.46
9.00	2.51	1.79	1.29	0.95	0.71	0.55	0.44	0.36

Salinity = 20 g/kg

pH	Temperature °C							
	0	5	10	15	20	25	30	35
7.00	247.6	170.5	117.5	80.98	55.83	38.51	26.58	18.36
7.20	156.3	107.7	74.21	51.17	35.30	24.37	16.84	11.66
7.40	98.67	68.01	46.90	32.35	22.34	15.44	10.70	7.43
7.60	62.33	42.98	29.66	20.48	14.17	9.82	6.82	4.76

7.80	39.40	27.19	18.78	13.00	9.01	6.26	4.37	3.07
8.00	24.93	17.23	11.92	8.27	5.76	4.02	2.83	2.01
8.20	15.80	10.94	7.59	5.29	3.70	2.61	1.86	1.34
8.40	10.04	6.97	4.86	3.41	2.41	1.72	1.24	0.91
8.60	6.41	4.47	3.14	2.22	1.59	1.15	0.85	0.65
8.80	4.11	2.89	2.05	1.47	1.07	0.80	0.61	0.48
9.00	2.67	1.90	1.36	1.00	0.75	0.57	0.46	0.37

Salinity = 30 g/kg

pH	Temperature °C							
	0	5	10	15	20	25	30	35
7.00	264.6	182.3	125.6	86.55	59.66	41.15	28.39	19.61
7.20	167.0	115.1	79.31	54.68	37.71	26.03	17.99	12.45
7.40	105.5	72.68	50.11	34.57	23.87	16.50	11.42	7.92
7.60	66.61	45.93	31.69	21.88	15.13	10.48	7.28	5.07
7.80	42.10	29.05	20.07	13.88	9.62	6.68	4.66	3.27
8.00	26.63	18.40	12.73	8.83	6.14	4.29	3.01	2.13
8.20	16.88	11.68	8.10	5.64	3.94	2.78	1.97	1.42
8.40	10.72	7.44	5.18	3.63	2.56	1.82	1.31	0.96
8.60	6.83	4.77	3.34	2.36	1.69	1.22	0.90	0.68
8.80	4.38	3.08	2.18	1.56	1.13	0.84	0.64	0.50
9.00	2.84	2.01	1.45	1.06	0.79	0.60	0.47	0.39

To calculate total ammonia nitrogen acute criteria values in saltwater at different pH and temperature values than those listed in this subsection, use the following formulas:

$$I = \frac{19.9273S}{(1000 - 1.005109S)}$$

Where I = molal ionic strength of water

S = Salinity ppt (g/kg)

The regression model used to relate I to pKa (negative log of the ionization constant) is

$$pKa = 9.245 + \frac{-1.38I}{0.138(I)}$$

pKa as defined by these equations is at 298 degrees Kelvin (25°C). T °Kelvin = °C + 273

To correct for other temperatures:

$$pKa^S_T = pKa^S_{298} + \frac{0.0324(298 - T \text{ °Kelvin})}{0.0324(298 - T \text{ °Kelvin})}$$

The unionized ammonia fraction (UIA) is given by:

$$UIA = \frac{1}{1 + 10^{(pKa^S_T - pH)}}$$

The acute ammonia criterion in saltwater is given by:

$$\text{Acute} = \frac{\frac{.233}{0.233}}{\text{UIA}}$$

Multiply the acute value by ~~0.22~~ 0.822 to get the ammonia-N acute criterion.

E. F. The 30-day average concentration of total ammonia nitrogen (in mg N/L) in saltwater shall not exceed, more than once every three years on the average, the chronic criteria below:

Chronic Ammonia Saltwater Criteria
 Total Ammonia Nitrogen (mg N/L)
 Salinity = 10 g/kg

pH	Temperature °C							
	0	5	10	15	20	25	30	35
7.00	34.84	24.00	16.54	11.40	7.86	5.42	3.74	2.59
7.20	21.99	15.15	10.45	7.20	4.97	3.43	2.37	1.64
7.40	13.89	9.57	6.60	4.55	3.15	2.18	1.51	1.05
7.60	8.77	6.05	4.18	2.88	2.00	1.38	0.96	0.67
7.80	5.55	3.83	2.65	1.83	1.27	0.88	0.62	0.43
8.00	3.51	2.43	1.68	1.17	0.81	0.57	0.40	0.28
8.20	2.23	1.54	1.07	0.75	0.52	0.37	0.26	0.19
8.40	1.41	0.98	0.69	0.48	0.34	0.24	0.18	0.13
8.60	0.90	0.63	0.44	0.31	0.23	0.16	0.12	0.09
8.80	0.58	0.41	0.29	0.21	0.15	0.11	0.09	0.07
9.00	0.38	0.27	0.19	0.14	0.11	0.08	0.07	0.05

Salinity = 20 g/kg

pH	Temperature °C							
	0	5	10	15	20	25	30	35
7.00	37.19	25.62	17.65	12.16	8.39	5.78	3.99	2.76
7.20	23.47	16.17	11.15	7.69	5.30	3.66	2.53	1.75
7.40	14.82	10.22	7.04	4.86	3.36	2.32	1.61	1.12
7.60	9.36	6.46	4.46	3.08	2.13	1.47	1.02	0.71
7.80	5.92	4.08	2.82	1.95	1.35	0.94	0.66	0.46
8.00	3.74	2.59	1.79	1.24	0.86	0.60	0.43	0.30
8.20	2.37	1.64	1.14	0.79	0.56	0.39	0.28	0.20
8.40	1.51	1.05	0.73	0.51	0.36	0.26	0.19	0.14
8.60	0.96	0.67	0.47	0.33	0.24	0.17	0.13	0.10
8.80	0.62	0.43	0.31	0.22	0.16	0.12	0.09	0.07

9.00	0.40	0.28	0.20	0.15	0.11	0.09	0.07	0.06
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Salinity = 30 g/kg

pH	Temperature °C							
	0	5	10	15	20	25	30	35
7.00	39.75	27.38	18.87	13.00	8.96	6.18	4.27	2.95
7.20	25.09	17.29	11.91	8.21	5.67	3.91	2.70	1.87
7.40	15.84	10.92	7.53	5.19	3.59	2.48	1.72	1.19
7.60	10.01	6.90	4.76	3.29	2.27	1.57	1.09	0.76
7.80	6.32	4.36	3.01	2.08	1.44	1.00	0.70	0.49
8.00	4.00	2.76	1.91	1.33	0.92	0.64	0.45	0.32
8.20	2.53	1.75	1.22	0.85	0.59	0.42	0.30	0.21
8.40	1.61	1.12	0.78	0.55	0.38	0.27	0.20	0.14
8.60	1.03	0.72	0.50	0.35	0.25	0.18	0.14	0.10
8.80	0.66	0.46	0.33	0.23	0.17	0.13	0.10	0.08
9.00	0.43	0.30	0.22	0.16	0.12	0.09	0.07	0.06

To calculate total ammonia nitrogen chronic criteria values in saltwater at different pH and temperature values than those listed in this subsection, use the following formulas:

$$I = \frac{19.9273S}{(1000 - 1.005109S)}$$

Where I = molal ionic strength of water

S = Salinity ppt (g/kg)

The regression model used to relate I to pKa (negative log of the ionization constant) is

$$pKa = 9.245 + \frac{-1.38I}{0.138(I)}$$

pKa as defined by these equations is at 298 degrees Kelvin (25°C). T °Kelvin = °C + 273

To correct for other temperatures:

$$pKa^S_T = pKa^S_{298} + \frac{0.0324(298 - T \text{ °Kelvin})}{0.0324(298 - T \text{ °Kelvin})}$$

The unionized ammonia fraction (UIA) is given by:

$$UIA = \frac{1}{1 + 10^{(pKa^S_T - pH)}}$$

The chronic ammonia criterion in saltwater is given by:

$$Chronic = \frac{\frac{-0.035}{0.035}}{UIA}$$

Multiply the chronic value by ~~-0.22~~ 0.822 to get the ammonia-N chronic criterion.

¹The default design flow for calculating steady state wasteload allocations for the acute ammonia criterion for freshwater is the 1Q10 (see 9VAC25-260-140 B footnote 10) unless

statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

²The default design flow for calculating steady state wasteload allocations for the chronic ammonia criterion for freshwater is the 30Q10 (see 9VAC25-260-140 B footnote 10) unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of the water quality criteria.

G. Implementation of Ammonia Criteria through VPDES Permits.

The ammonia criteria in subsections A through C shall be addressed during individual VPDES permit reissuance for existing dischargers subject to new or more restrictive water quality-based ammonia effluent limits in accordance with the Department's standard permitting practices except as follows.

1. Notwithstanding any other regulatory requirement, a compliance schedule may be established that exceeds the term of the permit, subject to a demonstration by the permittee that a longer period is necessary to allow a reasonable opportunity to attain compliance with the new or more restrictive ammonia discharge requirements. The Department's consideration for such a demonstration shall be made on a case-by-case basis, and shall require compliance as soon as possible, but not later than the applicable statutory deadline under the Clean Water Act.
2. Information to be provided under subsection F.1 may include, but is not limited to, such factors as: (i) opportunities to minimize costs to the public or facility owners by phasing in the implementation of multiple projects; (ii) time needed for freshwater mussel habitat determinations; and (iii) other relevant factors.
3. If a permit establishes a schedule of compliance which exceeds the term of the permit, the compliance schedule shall set forth interim requirements and the dates for their achievement.
 - a. The time between interim dates shall not exceed one year.
 - b. If the time necessary for completion of any interim requirement is more than one year and is not readily divisible into stages for completion, the permit shall specify interim dates for the submission of reports of progress toward completion of the interim requirements and indicate a projected completion date.
 - c. The permit shall be written to require that no later than 14 days following each interim date and the final date of compliance, the permittee shall notify the Department in writing of its compliance or noncompliance with the interim or final requirements, or submit progress reports if subdivision 3.b is applicable.
 - d. Any change to an interim compliance date in the schedule of compliance will be deemed to be a Minor Modification of the permit, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement.

ATTACHMENT 2

9VAC25-260-170. Bacteria; other recreational waters.

A. The following bacteria criteria (colony forming units (CFU)/100 ml) shall apply to protect primary contact recreational uses in surface waters, except waters identified in subsection B of this section:

E.coli bacteria shall not exceed a monthly geometric mean of 126 CFU/100 ml in freshwater and no more than 10% of the samples in the assessment period shall exceed a Statistical Threshold Value (STV) of 410 CFU/100 ml.

Enterococci bacteria shall not exceed a monthly geometric mean of 35 CFU/100 ml in transition and saltwater and no more than 10% of the samples in the assessment period shall exceed a Statistical Threshold Value (STV) of 130 CFU/100 ml.

1. See 9VAC25-260-140 C for boundary delineations for freshwater, transition and saltwater.

2. ~~Geometric means shall be calculated using all data collected during any calendar month with a minimum of four weekly samples. The Virginia Department of Health (VDH) shall make determinations regarding beach advisories or closures.~~

3. ~~If there are insufficient data to calculate monthly geometric means in freshwater, no more than 10% of the total samples in the assessment period shall exceed 235 E.coli CFU/100 ml.~~

4. ~~If there are insufficient data to calculate monthly geometric means in transition and saltwater, no more than 10% of the total samples in the assessment period shall exceed enterococci 104 CFU/100 ml.~~

5. ~~For beach advisories or closures, a single sample maximum of 235 E.coli CFU/100 ml in freshwater and a single sample maximum of 104 enterococci CFU/100 ml in saltwater and transition zones shall apply.~~

B. The following bacteria criteria per 100 ml (CFU/100 ml) of water shall apply:

~~E.coli bacteria shall not exceed a monthly geometric mean of 630 CFU/100 ml in freshwater.~~

~~Enterococci bacteria shall not exceed a monthly geometric mean of 175 CFU/100 ml in transition and saltwater.~~

1. ~~See 9VAC25-260-140 C for boundary delineations for freshwater, transition and saltwater.~~

2. ~~Geometric means shall be calculated using all data collected during any calendar month with a minimum of four weekly samples.~~

3. ~~If there is insufficient data to calculate monthly geometric means in freshwater, no more than 10% of the total samples in the assessment period shall exceed 1173 E.coli CFU/100 ml.~~

4. ~~If there is insufficient data to calculate monthly geometric means in transition and saltwater, no more than 10% of the total samples in the assessment period shall exceed 519 enterococci CFU/100 ml.~~

5. ~~Where the existing water quality for bacteria is below the geometric mean criteria in a water body designated for secondary contact in subdivision 6 of this subsection that higher water quality will be maintained in accordance with 9VAC25-260-30 A 2.~~

6. ~~Surface waters designated under this subsection are as follows:~~

a. ~~(Reserved)~~

b. ~~(Reserved)~~

ATTACHMENT 2

c. (Reserved)

ATTACHMENT 3

Water Quality Standards Regulation “Strawman” Amendment Language For Ammonia Criteria Implementation

9 VAC 25-260-155. Ammonia surface water quality criteria.

G. Implementation of Ammonia Criteria through VPDES Permits. The ammonia criteria in subsections A through C shall be addressed during individual VPDES permit reissuance for existing dischargers subject to new or more restrictive water quality-based ammonia effluent limits in accordance with the Department’s standard permitting practices except as follows.

1. Notwithstanding any other regulatory requirement, a compliance schedule may be established that exceeds the term of the permit, subject to a demonstration by the permittee that a longer period is necessary to allow a reasonable opportunity to attain compliance with the new or more restrictive ammonia discharge requirements. The Department’s consideration for such a demonstration shall be made on a case-by-case basis, and shall require compliance as soon as possible, but not later than the applicable statutory deadline under the Clean Water Act.
2. Information to be provided under subsection F.1 may include, but is not limited to, such factors as: (i) opportunities to minimize costs to the public or facility owners by phasing in the implementation of multiple projects; (ii) time needed for freshwater mussel habitat determinations; and (iii) other relevant factors.
3. If a permit establishes a schedule of compliance which exceeds the term of the permit, the compliance schedule shall set forth interim requirements and the dates for their achievement.
 - a. The time between interim dates shall not exceed one year.
 - b. If the time necessary for completion of any interim requirement is more than one year and is not readily divisible into stages for completion, the permit shall specify interim dates for the submission of reports of progress toward completion of the interim requirements and indicate a projected completion date.
 - c. The permit shall be written to require that no later than 14 days following each interim date and the final date of compliance, the permittee shall notify the Department in writing of its compliance or noncompliance with the interim or final requirements, or submit progress reports if subdivision 3.b is applicable.
 - d. Any change to an interim compliance date in the schedule of compliance will be deemed to be a Minor Modification of the permit, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement.

ATTACHMENT 4: Comparison of EPA's 2015 Final Updated Human Health AWQC and Previous AWQC (June 2015)

Pollutant	CAS No.	2015 EPA Human Health AWQC for the Consumption of		Previous EPA Human Health AWQC for the Consumption of	
		Water + Organism (.tg/L)	Organism Only (.tg/L)	Water + Organism (.tg/L)	Organism Only (.tg/L)
1,1,1-Trichloroethane	71-55-6	10,000	200,000	*	---
1,1,2,2-Tetrachloroethane	79-34-5	0.2	3	0.17	4
1,1,2-Trichloroethane	79-00-5	0.55	8.9	0.59	16
1,1-Dichloroethylene	75-35-4	300	20,000	330	7,100
1,2,4,5-Tetrachlorobenzene	95-94-3	0.03	0.03	0.97	1.1
1,2,4-Trichlorobenzene	120-82-1	0.071	0.076	35	70
1,2-Dichlorobenzene	95-50-1	1,000	3,000	420	1,300
1,2-Dichloroethane	107-06-2	9.9	650	0.38	37
1,2-Dichloropropane	78-87-5	0.90	31	0.5	15
1,2-Diphenylhydrazine	122-66-7	0.03	0.2	0.036	0.2
1,3-Dichlorobenzene	541-73-1	7	10	320	960
1,3-Dichloropropene	542-75-6	0.27	12	0.34	21
1,4-Dichlorobenzene	106-46-7	300	900	63	190
2,4,5-Trichlorophenol	95-95-4	300	600	1,800	3,600
2,4,6-Trichlorophenol	88-06-2	1.5	2.8	1.4	2.4
2,4-Dichlorophenol	120-83-2	10	60	77	290
2,4-Dimethylphenol	105-67-9	100	3,000	380	850
2,4-Dinitrophenol	51-28-5	10	300	69	5,300
2,4-Dinitrotoluene	121-14-2	0.049	1.7	0.11	3.4
2-Chloronaphthalene	91-58-7	800	1,000	1,000	1,600
2-Chlorophenol	95-57-8	30	800	81	150
2-Methyl-4,6-Dinitrophenol	534-52-1	2	30	13	280
3,3'-Dichlorobenzidine	91-94-1	0.049	0.15	0.021	0.028
3-Methyl-4-Chlorophenol	59-50-7	500	2,000	*	*
Acenaphthene	83-32-9	70	90	670	990
Acrolein	107-02-8	3	400	6	9

Comparison of EPA's 2015 Final Updated Human Health AWQC and Previous AWQC (June 2015)

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		Water + Organism (.tg/L)	Organism Only (.tg/L)	Water + Organism (.tg/L)	Organism Only (.tg/L)
Acrylonitrile	107-13-1	0.061	7.0	0.051	0.25
Aldrin	309-00-2	0.00000077	0.00000077	0.000049	0.00005
alpha-Hexachlorocyclohexane (HCH)	319-84-6	0.00036	0.00039	0.0026	0.0049
alpha-Endosulfan	959-98-8	20	30	62	89
Anthracene	120-12-7	300	400	8,300	40,000
Benzene	71-43-2	0.58 - 2.1	16 - 58	0.61 - 2.2	14 - 51
Benzidine	92-87-5	0.00014	0.011	0.000086	0.0002
Benzo(a)anthracene	56-55-3	0.0012	0.0013	0.0038	0.018
Benzo(a)pyrene	50-32-8	0.00012	0.00013	0.0038	0.018
Benzo(b)fluoranthene	205-99-2	0.0012	0.0013	0.0038	0.018
Benzo(k)fluoranthene	207-08-9	0.012	0.013	0.0038	0.018
beta-Hexachlorocyclohexane (HCH)	319-85-7	0.0080	0.014	0.0091	0.017
beta-Endosulfan	33213-65-9	20	40	62	89
Bis(2-Chloro-1-Methylethyl) Ether	108-60-1	200	4,000	1,400	65,000
Bis(2-Chloroethyl) Ether	111-44-4	0.030	2.2	0.03	0.53
Bis(2-Ethylhexyl) Phthalate	117-81-7	0.32	0.37	1.2	2.2
Bis(Chloromethyl) Ether	542-88-1	0.00015	0.017	0.0001	0.00029
Bromoform	75-25-2	7.0	120	4.3	140
Butylbenzyl Phthalate	85-68-7	0.10	0.10	1,500	1,900
Carbon Tetrachloride	56-23-5	0.4	5	0.223	1.6
Chlordane	57-74-9	0.00031	0.00032	0.0008	0.00081
Chlorobenzene	108-90-7	100	800	130	1,600
Chlorodibromomethane	124-48-1	0.80	21	0.4	13
Chloroform	67-66-3	60	2,000	5.7	470
Chlorophenoxy Herbicide (2,4-D)	94-75-7	1,300	12,000	100	---
Chlorophenoxy Herbicide (2,4,5-TP) [Silvex]	93-72-1	100	400	10	---

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		Water + Organism (.tg/L)	Organism Only (.tg/L)	Water + Organism (.tg/L)	Organism Only (.tg/L)
Chrysene	218-01-9	0.12	0.13	0.0038	0.018
Cyanide	57-12-5	4	400	140	140
Dibenzo(a,h)anthracene	53-70-3	0.00012	0.00013	0.0038	0.018
Dichlorobromomethane	75-27-4	0.95	27	0.55	17
Dieldrin	60-57-1	0.0000012	0.0000012	0.000052	0.000054
Diethyl Phthalate	84-66-2	600	600	17,000	44,000
Dimethyl Phthalate	131-11-3	2,000	2,000	270,000	1,100,000
Di-n-Butyl Phthalate	84-74-2	20	30	2,000	4,500
Dinitrophenols	25550-58-7	10	1,000	69	5,300
Endosulfan Sulfate	1031-07-8	20	40	62	89
Endrin	72-20-8	0.03	0.03	0.059	0.06
Endrin Aldehyde	7421-93-4	1	1	0.29	0.3
Ethylbenzene	100-41-4	68	130	530	2,100
Fluoranthene	206-44-0	20	20	130	140
Fluorene	86-73-7	50	70	1,100	5,300
gamma-Hexachlorocyclohexane (HCH)	58-89-9	4.2	4.4	0.98	1.8
Heptachlor	76-44-8	0.0000059	0.0000059	0.000079	0.000079
Heptachlor Epoxide	1024-57-3	0.000032	0.000032	0.000039	0.000039
Hexachlorobenzene	118-74-1	0.000079	0.000079	0.00028	0.00029
Hexachlorobutadiene	87-68-3	0.01	0.01	0.44	18
Hexachlorocyclohexane (HCH)-Technical	608-73-1	0.0066	0.010	0.0123	0.0414
Hexachlorocyclopentadiene	77-47-4	4	4	40	1,100
Hexachloroethane	67-72-1	0.1	0.1	1.4	3.3
Indeno(1,2,3-cd)pyrene	193-39-5	0.0012	0.0013	0.0038	0.018
Isophorone	78-59-1	34	1,800	35	960
Methoxychlor	72-43-5	0.02	0.02	100	---

Comparison of EPA's 2015 Final Updated Human Health AWQC and Previous AWQC (June 2015)

Pollutant	CAS No.	2015 EPA Human Health AWQC for the Consumption of		Previous EPA Human Health AWQC for the Consumption of	
		Water + Organism (.tg/L)	Organism Only (.tg/L)	Water + Organism (.tg/L)	Organism Only (.tg/L)
Methyl Bromide	74-83-9	100	10,000	47	1,500
Methylene Chloride	75-09-2	20	1,000	4.6	590
Nitrobenzene	98-95-3	10	600	17	690
Pentachlorobenzene	608-93-5	0.1	0.1	1.4	1.5
Pentachlorophenol	87-86-5	0.03	0.04	0.27	3
Phenol	108-95-2	4,000	300,000	10,000	860,000
p,p'-Dichlorodiphenyldichloroethane (DDD)	72-54-8	0.00012	0.00012	0.00031	0.00031
p,p'-Dichlorodiphenyldichloroethylene	72-55-9	0.000018	0.000018	0.00022	0.00022
p,p'-Dichlorodiphenyltrichloroethane (DDT)	50-29-3	0.000030	0.000030	0.00022	0.00022
Pyrene	129-00-0	20	30	830	4,000
Tetrachloroethylene (Perchloroethylene)	127-18-4	10	29	0.69	3.3
Toluene	108-88-3	57	520	1,300	15,000
Toxaphene	8001-35-2	0.00070	0.00071	0.00028	0.00028
trans-1,2-Dichloroethylene (DCE)	156-60-5	100	4,000	140	10,000
Trichloroethylene (TCE)	79-01-6	0.6	7	2.5	30
Vinyl Chloride	75-01-4	0.022	1.6	0.025	2.4

*AWQC for this chemical were not provided in EPA's previous update.